ELECTRICAL REVIEW

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Improved Pole Lines

Reconciling Low Cost with Reliability

IN order to connect to the public mains the remaining 25 per cent or so of the total of reachable premises in rural areas, it can be said that at least as great a length of mains as already exist will be needed, while a lower average revenue to the route mile is to be expected. The utmost economy in construction is consequently called for. At the same time the standard of reliability should be as nearly as possible equal to that enjoyed in more thickly populated centres.

E.R.A. Investigations

These not easily reconcilable requirements—lowered first cost of overhead lines and lessened liability to interruption in supply—are, it is claimed, met in the new design of wood-pole line which, based upon initial investigations by the E.R.A., is now specified by the British Standards Institution, as described in this issue. From information given us by supply engineers who have operated trial installations, comprising in the aggregate upwards of 850 miles of such lines, during the past half-dozen years and confirmed by the opinion of Post Office engineers from their own angle, the claim appears to be well substantiated.

Although voltages above 11 kV are not covered, a reasonable deduction from the I.E.E. Transmission Section paper by Messrs. H. Willott Taylor and K.L. May two and a half years ago is that the design could be widely adopted with advantage for still higher voltages. Further scope can be envisaged in the reconstruction of existing systems as these become necessary.

Available experience indicates that a line which utilizes, as this does, the additional insulation resistance of its supports is more free from lightning damage (burned poles now being an almost negligible hazard) than one of the ordinary kind with the metal work earthed. It is also probably safer in view of the sense of false security likely to be felt in the latter case, since low-resistance earths may be difficult to obtain everywhere. So far no instance of vibration trouble has been reported with this type of construction, while the horizontal formation of conductors makes them less liable to transient earth faults, the commonest cause of interruptions to supply, and also enables the pole height to be reduced, resulting in a less conspicuous line. In addition, this formation facilitates interchangeability in regard to section and angle poles.

Inclusion of Design Details

The new Specification represents a departure from normal B.S.I. procedure in that it goes beyond establishing criteria of quality, performance and tests and prescribes details of design. This invites the question as to whether any obstacle to progress is a likely consequence. There is, however, the safeguard contained in the provisions made for the use of alternative materials and methods, which give reasonable flexibility. Moreover, compliance with the Specification is not obligatory, although its adoption will eliminate much of the work necessary when obtaining the Electricity Commissioners' approval to a new line.

Progress in the economic electrification of the countryside in the near future will depend largely upon the ability to import timber of the requisite quality, and priority should be given to the needs of the electrical industry in this respect. In any case the magnitude of the extensions necessary and their immediacy indicate the need for a considerable degree of standardization. The ability to purchase "off-the-shelf" components for a simple design that represents the pooled experience of engineers of a diversity of undertakings is a factor of the greatest value in time as well as in money.

I.M.E.A. Supports Nationalization

UNLIKE the companies' organizations the municipal electricity supply authorities, as represented by the I.M.E.A., have decided to concur in the nationalization of the industry. It was easier for them thus to bow to the inevitable, for in their case nationalization means only a change in the form of public ownership. It may also be claimed that it was the existence of so many separate municipal undertakings which led to the original demand for "integration"—a course which the company groups have been pursuing for many years. The question is whether any proposed form of grouping will be better than the structure which the companies have built up and in the building of which they have been accused of "monopolization"—quite unjustly for the most part. The I.M.E.A. hopes that the generating stations and main transmission lines will be handed over to the Central Electricity Board and that any measures for co-ordinating distribution will take account of the need for retaining the "local touch."

Fuel Economy

POWER station engineers have been accused in the past of making a fetish of thermal efficiency. That one-time peculiarity has now come to be regarded, rightly, as a virtue. Yet the very fact that there is no slack to take up leaves them with a feeling of impotence in their inability to give appreciable assistance to the national fuel economy campaign. Nevertheless the autumn conference, under the chairmanship of Dr. E. S. Grumell, arranged in this connection by the Ministry of Fuel and Power with the co-operation of the Institute of Fuel should be of interest to them, particularly the discussion on sizing and grading of coal to be held on October 10th, and no doubt also the Melchett Lecture during the evening of October 8th. There will be a better factual basis than hitherto for the proposed discussion of district heating on the third day, in view of the probable publication before then of an authoritative report on the subject.

Rising Output

A FURTHER increase in the rate at which electricity production is increasing is recorded in the July figures issued by the Electricity Commissioners. In the first six months of the year authorized undertakings generated 20,481 million kWh, exceeding production in the corresponding period of last year by 6·4 per cent. In July 2,764 million kWh was generated, representing a rise of 8·8 per cent and raising the rate of expansion for the seven months to 6·7 per cent (total 23,244 million kWh). The output for the month was 2,597 million kWh and for the seven months 21,925 million kWh.

Power Station Emissions

REGARDING the recommendation of the L.C.C. Housing and Public Health Committee that the Ministry of Fuel should institute an inquiry into the extent of the discharge of sulphur from power station chimneys and methods of preventing it, the requisite data should not be difficult to obtain. Although this aspect was not included in the terms of reference of the Taite Committee set up by the Electricity Commissioners in 1930, the general conclusions then reached should be enough in general to cover emissions of all kinds. Subsequent experience in special cases has been gained at Battersea and Fulham. The present issue has been raised in connection with the proposed Poplar power station.

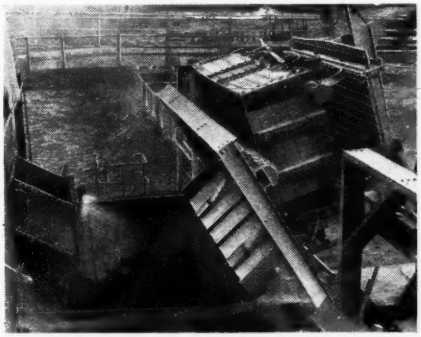
Save Paper

EARLIER appeals for waste paper, coupled with a suggestion that any money received for it should be sent to the Electrical Industries Benevolent Association, resulted in contributions to the Association's funds totalling nearly £900. The need for paper persists and donations are always welcomed by the E.I.B.A. We suggest that readers should renew their salvage activities and pass on the proceeds.

Production of Crude Oil from Shale

IN the *Electrical Review* of July 19th we published an article on "Oil-Shale Winning" as the first result of a recent visit, by the courtesy of Scottish Oils, Ltd., to see the extensive use which is made of electricity in the shale-oil industry in Mid and West Lothian. It is now our purpose to describe the electrical applications to the retorting processes carried out in the crude-oil works which are supplied with shale from the various mines in the area.

It has been pointed out that in some cases the "green" shale is first crushed at the pit-head and in others at the crude-oil works. In principle the production is the same at all the crude-oil works, so it will facilitate both writing and reading if we deal almost entirely with the most modern of the works, namely, the one at Westwood.



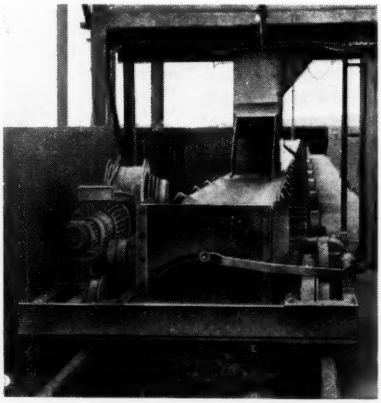
The green shale wagon tippler has a capacity of 230 tons per hour

Shale is received from a distant pit in railway wagons and from an adjoining pit in tubs which run by gravity down to the works receiving point. Both the wagons and the tubs are received by tipplers and unloaded into the same hopper. The smaller tipplers for the tubs are operated by a 7½-H.P. motor. The wagon tippler will handle 10-ton trucks and has a capacity of 230 tons per hour, and its 25-H.P. motor transmits through a "Radicon" reducing gear to the single-rope drum by which the lever equipment for tilting the wagon carriage is raised.

From the hopper, the shale is fed into a spiked-drum crusher or breaker which is served by a 60-H.P. motor with transmission first through a worm gear and then through heavy pinion gear to the crusher drum shaft, with an actual overall reduction of from 740 to 4½ r.p.m. The shale from the crusher equipment falls on to a short 5-H.P. motor-driven 42-in. wide belt conveyor which has a capacity of 225 tons per hour and a speed of 60 ft per minute, and feeds the shale on to a long inclined 30-in. wide belt conveyor by which the shale reaches the top of the retorts, about

95 ft above ground level. Actually there are two crushers, each with its own cross conveyor, and interlocking provides that only one conveyor will operate with its appropriate breaker. The 30-in. main conveyor also has a capacity of 225 tons per hour, but its speed is greater—330 ft per minute. The drive is by a 55-H.P. motor, and the belt is 448 ft long between the end pulleys. At the top, the main conveyor feeds on to a shuttle conveyor which runs centrally over a line of bunkers, with a capacity of 1,860 tons, which serve the retorts beneath.

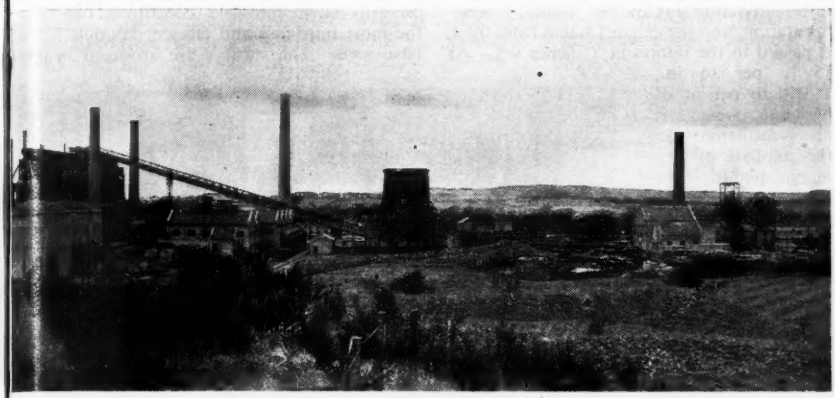
The endless reversible shuttle conveyor is mounted on a travelling carriage with a range from end to end of the bunkers. The conveyor's 10-H.P. motor is mounted on the carriage and is supplied by a trailing cable from a central plug point. There is a special take-up drum for the slack cable. The shuttle-main-and-cross-conveyor and the shale breaker motors are sequence interlocked in the order given, so that the shuttle conveyor must be run up first and the breaker last. All the motors for these equipments and for the wagon and tub tipplers are contactor operated and remotely controlled, including reversing of the breaker and shuttle conveyor motors, by push-button stations near the equipments.



Endless reversible shuttle conveyor mounted on a travelling carriage

There are 104 retorts arranged in two benches. Each retort has a cast-iron portion at the top, 14 ft high, and a firebrick portion at the bottom, 20 ft high. The whole assembly opens out from 2 ft 9½ in. by 1 ft 2⅜ in. at the top to 4 ft 8 in. by 1 ft 10 in. at the bottom. Under the firebrick part is a spent shale hopper. As the shale passes gradually down through the retort, at the rate of about 12 tons in 24 hours, oil and ammonia vapours and permanent gas are released from the shale by the heat from the permanent gas with which the retorts are fired in chambers surrounding the distilling chambers. Exhaust steam from a nearby steam container is injected into the base of the retorts during the process, to provide the hydrogen necessary for combination with the nitrogen of the shale to form ammonia. Air is also introduced to assist the combustion of the carbon of the shale.

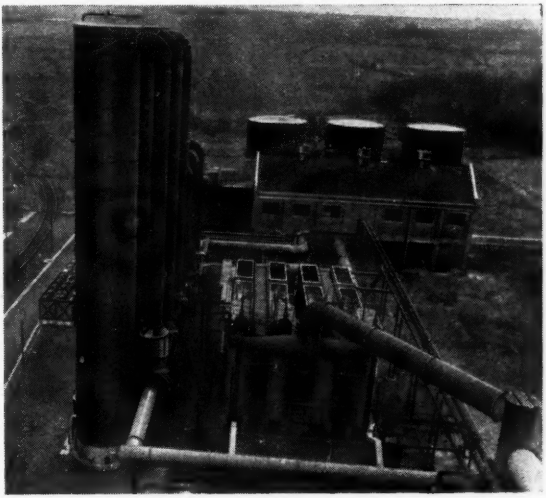
The mixture of vapours, steam and gases is drawn from the retorts by turbine-driven exhausters and passed to a bank of water-



The Westwood Crude-Oil Works presents an impressive lay-out. Right to left: Pit from which the works receives part of its shale; cooling tower dealing with water from retort vapour condensers; ammonium sulphate plant; green shale conveyor to retorts; crude-oil storage tanks; oil and water scrubbers; products pump house; naphtha plant and storage; ammonia water storage; spent shale bings

cooled condensers in which the oil and water vapours condense, leaving a mixture of oil and ammonia liquor, and gas containing light spirit and some ammonia. The liquor mixture is passed on to separating tanks from which the crude oil goes to railway tanks for conveyance to the central refinery at Pumpherston, and the ammonia water is passed on to another part of the works as the raw material for the production of sulphate of ammonia. The gas mixture from the condensers is passed through scrubbers in which it is first subjected to a spray of water which absorbs the ammonia, and then to a spray of oil which extracts the spirit. The remaining or permanent gas is the retort-firing gas already referred to. Producer gas plant is available to augment the retort firing, if necessary, but so far this has not been required. The waste gases from the heating chambers of the retorts are passed through two 6,000-lb per hour 120-lb/sq in. waste-heat boilers. About 1,100 lb of steam and 5,000 cu ft of air per ton of shale are fed into the retorts, and about 20 gallons of crude oil and 30 lb of sulphate of ammonia are obtained from a ton of shale.

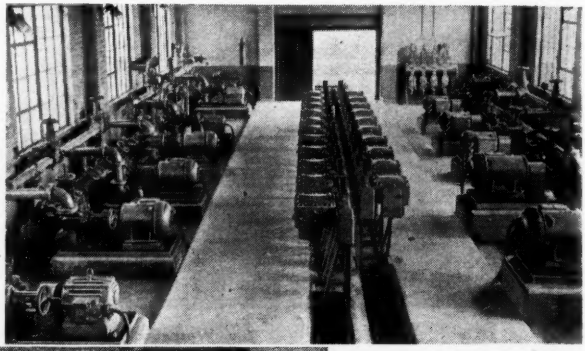
The main steam source for the retorts is four Clarke Chapman 30,000-lb per hour boilers with steaming conditions of 200 lb per sq in. and 500 deg F. These supply directly two Belliss & Morcom back-pressure 6,000/1,000-r.p.m. 2,250-kVA 3,300-V



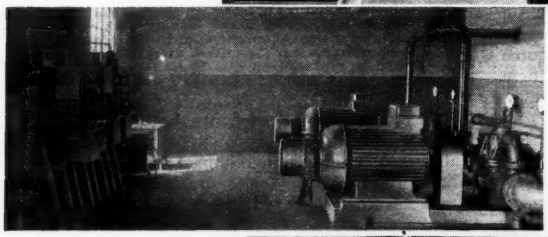
The mixture of vapours from the retorts is passed to a bank of water-cooled condensers (right); the gas mixture from the condensers is passed to the scrubbers (left)

turbo-alternator sets in the works generating station, and the exhaust steam from these is passed to the retorts at 7 inches w.g. At 15 lb per sq in., 15,000 lb per hr of pass-out steam is also available for the sulphate of ammonia plant. The exhauster turbines are supplied from the waste-heat boilers, and the exhaust from these at 7 inches w.g. is also fed to the retorts.

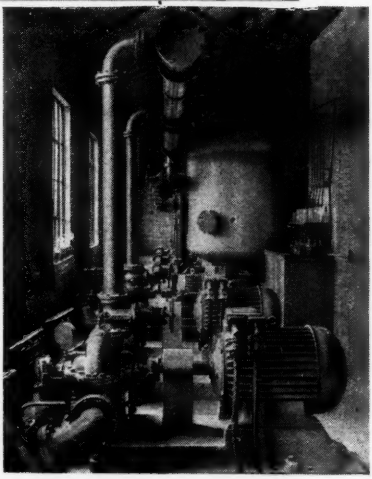
Very considerable pumping operations are required for conveying partly and completely processed products, such as crude oil and ammonia water, in and about the works, and all the pumps required for this purpose are centralized in a products pump house. About a score of pumps are involved. They are all of the centrifugal type and the individual duties vary considerably up to, say, 14,000 gallons per hour. The motors, up to 22 H.P. each, are mainly of the totally enclosed externally fan-cooled flameproof type, and they are disposed in two rows along each side of the pump house. This arrangement, together with the two back-to-back lines of starters centrally down the aisle, constitutes one of the most imposing and efficient lay-outs we have seen. The starters are arranged near their corresponding motors. The directly-coupled motors are squirrel-cage 440-V equipments, and the starters are direct-on or star-delta oil-filled flameproof type units. The starters are all Metrovick products.



The products pump house presents an imposing and efficient lay-out



About 30,000 gallons of water per hour is required at the works and is obtained mainly from the River Almond pumping station



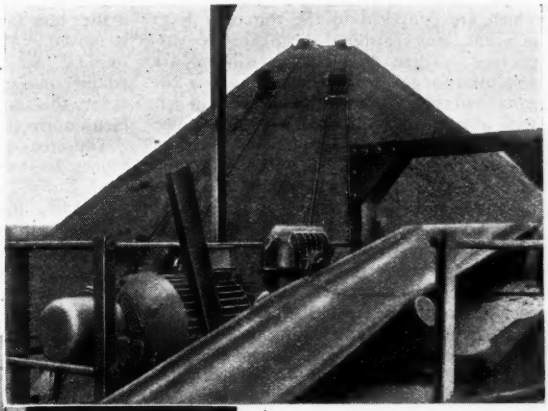
The general works water is treated and pumped through large cylindrical filters

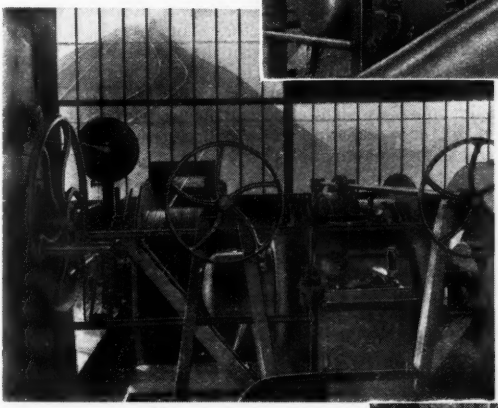
Something like 30,000 gallons of water per hour is required throughout the works. This demand is met mainly by two turbine pumps in a pumping station at Breich Pit. They each have a capacity of 1,200 gal per min against a 130-ft head, and draw water from the River Almond. The 87-H.P., 3,200-V, 1,485-r.p.m. directly-coupled motors are Bruce Peebles totally enclosed fan-cooled

units. A supplementary supply of water is obtained from the Breich Water by a 60-H.P., 1,470-r.p.m. motor - driven pump which has a capacity of 1,000 gal per min against a head of 140 ft.

The water for general works purposes is treated in a large tank with lime and aluminium sulphate and passed through four large cylindrical filters by means of 9-H.P., 1,460-r.p.m. directly motor-driven centrifugal pumps, each of which will handle 30,000 gallons of water per hour against the filter resistance. Here again the motors are Bruce Peebles totally enclosed externally fan-cooled units. Water from the primary condensers is passed into a boiler feed-water tank for treatment with soda, lime and sodium aluminate. It is then pumped through a set of three filters and on to the boiler feed tank. These 5-H.P. motor-driven pumps are similar to the others and each has a capacity of 14,000 gallons per hour.

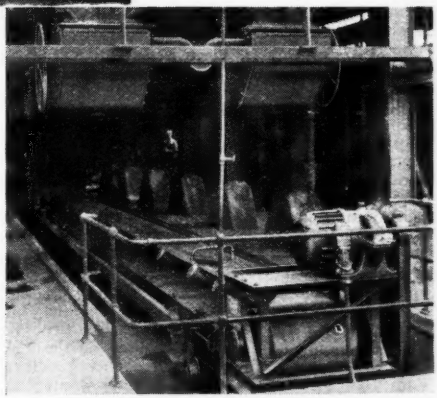
The spent shale from the retorts falls on to aligned cross conveyors. There are two of these, and they convey the shale inwards to a central point where they feed on to main conveyors. Each cross conveyor is driven by a 5-H.P., 1,460-r.p.m.





Right : Each main spent shale conveyor handles 180 tons per hour ; drive at top end
Below : The double drum 160-H.P. spent shale winder hauls two 6-ton bogies up an incline of 1 in 3·5

Metrovick s.c. geared motor unit with an overall ratio of 36 to 1, which results in a conveyor speed of 200 ft per min, at which speed the handling capacity is 180 tons per hour. Each main conveyor has a similar capacity and it transports the shale at an angle of about 16 deg from the horizontal to an elevated bunker of 100 tons capacity. The belt speed is 250 ft per min and the 20-H.P.,



Spent shale from the retorts falls on to aligned cross conveyors ; drive at outer end of one conveyor

730-r.p.m., s.r. motor transmits to the top end drum of the conveyor with a speed reduction ratio of about 15 to 1.

The bunkers discharge into 6-ton bogies which are conveyed to the top of a huge adjacent bing (disposal heap) to be discharged. Three double-drum winders are employed for this work, there being two 8-ft gauge rail tracks up the bing for each winder, with a gradient of 1 in 3·5, i.e., when one bogie is going up the bing the other is coming down. As each bogie approaches the top of the bing it runs on to a cantilever with a raised set of rails of narrower gauge. These narrower rails engage with secondary flanges on the bogie wheels. A trigger on the cantilever releases the tipping gear as the bogie enters the cantilever. The winders are each driven by a 160-H.P., 735-r.p.m., s.r. motor with pinion gear transmission to the drum shaft, with a ratio of 20 to 1. The rope speed is six miles per hour.

The winder motor is operated by contactor gear which is governed by a master controller. The master controller operates main contactors for forward and reverse, and for the first step of the rotor resistance. The remaining five steps of the rotor resistance are operated by the master controller through magnetic time relays which ensure that the motor is not accelerated too quickly, no matter how fast the master controller handle is moved. All the contactors are actuated by D.C. which is supplied from a metal rectifier on site. A static condenser connected across the stator circuit provides for power-factor correction.

The cross conveyors and the main conveyors are sequence interlocked, so that neither of the cross conveyors can be started until one of the main conveyors is under way. All these conveyors are operated by contactor gear which is remotely controlled. There are push-button stations at convenient points along the conveyor routes which provide for local stopping and starting of the conveyors.

We are indebted to Mr. Robert Crichton, managing director, Scottish Oils, Ltd., for permission to visit the works and to publish this article, and to Mr. G. A. McLennan, chief electrical engineer, and Mr. W. Sterling, assistant electrical engineer, for their help in preparing the article and taking the photographs.

Nationalization Plans

I.M.E.A. Decision

THE Incorporated Municipal Electrical Association at a well-attended extraordinary general meeting held at Caxton Hall, Westminster, on Thursday last week, passed the following resolutions practically unanimously after a very full discussion:—

(a) The Minister of Fuel and Power having intimated the Government's intentions with regard to the electricity supply industry, this Association declares its willingness to co-operate with the Government in arriving at the best form of re-organization and administration of the industry.

(b) It being part of the declared policy of the Government to transfer the ownership and control of the generating stations and main transmission lines to a central body, this Association approves the principle, subject to suitable safeguards, and recommends that such body be the Central Electricity Board.

(c) This Association approves the principle of public ownership of the whole of the electricity supply industry, and considers that in the best interests of the consumers and of the nation the maximum amount of local authority administration and control be ensured on the distribution side of this vital public service.

(d) That the Council through its appropriate Committee be empowered to meet the Minister to submit and discuss the foregoing resolutions.

Following upon these resolutions it is expected that further consultations with the Minister will take place in the near future. The Association represents 348 local authority electricity undertakings, comprising 95 per cent of all local authorities owning electricity undertakings.

Building Industries Inquiry

THE Committee appointed by the Minister of Works to inquire into the distribution of building materials and components has held its first meeting. The Committee has already invited the submission of written evidence from representative bodies of the builders' merchants, building materials producers and users of building materials and components, and from a number of separate authorities, firms and individuals. The Committee would also be glad to receive written statements from any other organization or individual concerned with the production, distribution or use of building materials and components, or from any other interested person who feels that he has something of value to offer which would assist the Committee in its inquiry. Communications should be addressed to the Secretary of the Committee, Mr. W. P. D. Skillington, Ministry of Works, Lambeth Bridge House, London, S.E.1.

Views on the News

Reflections on Current Topics

A POPULAR tendency is illustrated in the correspondence columns of the *Architect and Building News*, where reference is made to the "absurdity" of erecting two sets of poles for carrying power and communication lines. A layman not unnaturally fails to understand how, when the two circuits run in parallel, earth-fault currents in the power mains can adversely affect the telephone system, if not directly then through electromagnetic induction. The writer would have more legitimate cause for complaint if he received either electric or acoustic shocks when using his telephone or if the service were dislocated possibly through damage by fire to the Post Office plant. Again harmonic currents in the power line may induce audio-frequency currents in the other that would disturb conversation. Post Office engineers, while very properly safeguarding the interests of telephone subscribers, have shown every disposition to assist power-transmission engineers to cheapen construction.

* * *

It is a matter of some surprise that at the present time, when undertakings are faced with steeply rising costs, a number of them are making even larger allocations than hitherto to assist in reducing local rates. I have just seen a report in a Sunderland paper of an electricity "windfall" of £12,500 for the rates. At Nottingham £35,000—the entire surplus apart from a few pounds—goes to the rates. Clearly, this is a short-sighted policy, but the reason may possibly be found in the recent statement by a Finchley councillor that it is not known whether, under nationalization, the acquiring authority will be empowered to take over liquid resources "and there is no reason to build up the reserve fund to an unnecessarily high level."

* * *

During the next month or two manufacturers will be showing their latest developments at a number of exhibitions in various parts of the country. The first post-war Public Lighting Apparatus and Equipment Exhibition, which brings together public lighting engineers from all over the country, will be staged at the Central Hall, Westminster, from September 10th to 12th. Welsh industries will be given the opportunity of displaying their products at the Welsh Industries Fair at the Drill Hall, Cardiff, from September 23rd to 28th. The "Britain Can Make It" Exhibition, which commences at the Victoria and Albert Museum, South Kensington, on September 24th will show the latest designs in all the main ranges of consumers' goods, and will, of course, include an extensive electrical display. In November there is to be a Scientific and Technical Exhibition at Kelvin Hall, Glasgow (from November 15th to 17th), and I see from a preliminary list of exhibitors I have received, that electrical and allied interests will be well represented. There is also, of course, the British Industries Fair, and although this is not being held until May next year, those who intend to take part are no doubt already preparing their plans for the most important and comprehensive of British exhibitions.

* * *

It has been said that anything which can be imagined by man is possible of achievement in course of time. It is certainly true that many of the developments and devices imagined by H. G. Wells have been realized in a comparatively short span—a shorter span than he himself sometimes considered possible. Take for example "When the Sleeper Awakes" which appeared in 1899. Among other things this story visualized broadcasting and the public address system, television, "daylight" illumination and air conditioning on a grandiose scale, and many other advances which have become or are becoming commonplace. In other words the all-electric age. But there may be some among us who would rather have a backward-operating time machine.

* * *

The shortage of labour is one of the many problems with which electrical manufacturers are faced, and the lack of housing accommodation within a reasonable distance of the works contributes to this problem. At the recent extraordinary meeting of the English Electric Co., Ltd., Sir George Nelson (chairman), mentioned that the company was forming a housing association which he hoped would materially assist in solving this problem. I now learn that the Kingsway Housing Association, Ltd., has been formed with a capital of £100,000 of which Sir George and other members of the English Electric organization are directors.

* * *

I have received a circular telling me that "it is the hope of the Post Office that within a period of five years it will be possible for any of its subscribers to telephone to anywhere in Europe on a 'no delay' basis." My own hope is more modest—it is that within this period I shall be able to obtain a local call on this basis.—**REFLECTOR.**

The Domestic Load

Forecasting Lines of Development

By H. A. P. Caddell,
B.A., A.M.I.E.E.

STATISTICIANS, in studying a phenomenon that is not subject to laboratory control, are accustomed to find that it is related not to a single cause but to a tangled skein of causation, the causes being variable and acting in varying degrees on the phenomenon. Load-analysis problems, to which statistical methods are being increasingly applied, are no exception to this. Often, on the other hand, in practice such phenomena are freely presented over a wide range of conditions and a relation between cause and effect may be broadly traced by the study of samples in these different conditions. This has suggested the possibility of applying this method to the prediction of the probable lines of development of the domestic load.

The information presented refers only to a limited area and does not claim more than local significance. Moreover the degree of accuracy obtainable is not high, ± 10 per cent being expected. The conduct of such investigations to the necessary degree of accuracy and over a broad field lies properly within the province of the Electrical Research Association, by whom, it is understood, load-analysis problems are being energetically pursued. It is hoped nevertheless that the information given may be interesting and suggestive to supply engineers.

The load of an individual group of domestic consumers will principally depend on: Time of day and day of week; weather conditions, primarily illumination and temperature; appliances installed and their loading.

From the cost aspect, it is necessary to know, first, the load of a group of consumers at the time of system peak, this, with their annual consumption determining their load factor in relation to generating and transmission plant; and secondly, their load at the time of peak on the local distribution plant, this conditioning their load factor on this local plant. For some distribution plant, such as high-voltage feeders, both the first and second items will have a bearing on the load factor, but this has been omitted for simplicity.

Study of load curves showed that the most probable time of system peak was from 8 to 8.30 a.m. on a weekday and of peak on the local distribution plant Sunday midday, both under the worst conditions of temperature and illumination. As the loads at these times need only be dealt with, the possibility was opened up of ascertaining them by means of a methodical series of spot tests over a number of consumer groups in which the installed load, indicating the state of development, varied over a wide range, provided the effect of the weather factors indicated above could be reduced to the common denominator of worst conditions. While in a number of cases readings were obtained at, or very close to, the system peak or on Sundays under the worst conditions as indicated in general by the system load, this was obviously not possible in every case. A system of weighting was therefore calculated, based on the fact that for a number of consumer groups readings at or near the system maximum and at the lower system loads were available. The weighting adjustments were small and exceeded 10 per cent in only a few cases. Incidentally, in the calculation of these weightings definite indications were found that the domestic heating load reaches its maximum at Sunday midday. While this is surprising, it is probably due simply to diversity at that time being small and may well be a common effect.

The actual load will in addition be influenced by the number of consumers in the group and by the laws of chance, as demonstrated by Schiller (*Electrical Review*, December 29th, 1944), and possibly also by rateable value. As the bulk of the consumer groups dealt with show no wide difference in numbers of consumers and average rateable value and as reliance is not placed on individual spot tests, the errors introduced by these factors are negligible in relation to the accuracy expected.

The load figures were obtained by taking current readings at the distribution transformer low-voltage terminals every five minutes during the half hours stated and averaging these over the half hour, this process having been tested against and being similar to integrating the readings of a recording ammeter. Cold snap conditions

are not covered. The results are shown in Fig. 1 (*a*), (*b*) and (*c*), each entry indicating a particular group of consumers, the average number of consumers per group being 101. While there are some indications at the higher end of the scale of departure from a straight line relationship, it is not considered that there is sufficient information to justify this and consequently the most probable straight lines have been plotted on the method of least squares. Generally the purposes of load analysis are best served by relating after-diversity demand to a defined class of appliance, and connected load is used here only in order to indicate the broad picture.

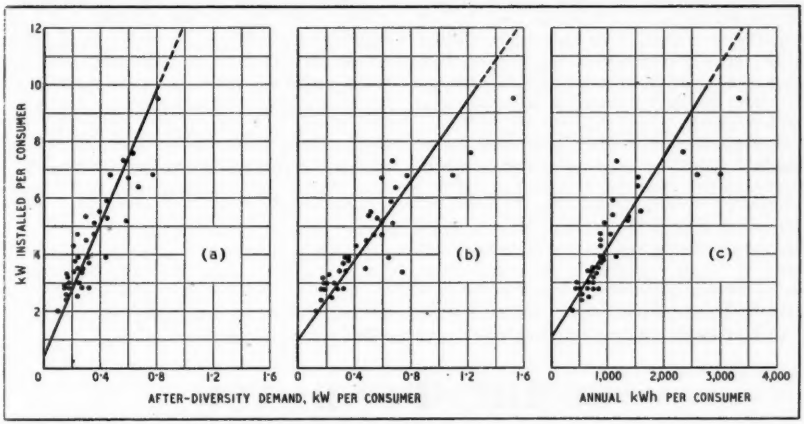


Fig. 1.—Relationships between average installed load per consumer and : (a) average after-diversity demand per consumer at system peak, 8 to 8.30 a.m. on winter weekdays, (b) average after-diversity demand per consumer at distribution peak, midday on winter Sundays, (c) average annual kWh per consumer

What is the practical import of these graphs to the undertaking concerned ?

The relation between Fig. 1 (*a*) and (*c*) indicates that the load factor of the domestic load in relation to the generating plant increases from about 32 per cent at the lowest stage of development, represented by 2·5 kW installed load per consumer, to about 39 per cent at the highest stage of 10 kW per consumer, implying the importance of a progressive development policy.

Fig. 1 (*b*) and its relation to Fig. 1 (*c*) bear on the question of distribution costs, which has received much less investigation than that of generating costs.

The predominating influence in distribution capital and costs is the distances by which communities and premises are separated. For an existing distribution system supplying a given configuration of premises, distribution costs per consumer will remain broadly constant so long as its capacity remains adequate for the load to be carried. As far as capacity is concerned, what appears to be significant is capacity in kW per consumer. While the author has seen no figures quoted on these lines for existing distribution systems, perhaps something of the order of 1 kW per consumer might represent a figure typical of small property. Fig. 1 (*b*) shows that the a.d.d. at time of distribution peak approaches 1 kW when the installed load is 8 kW and the consumption 2,000 kWh per year. The calculation of capacity on these lines for existing distribution systems on the limiting basis of voltage drop and, making allowance for practical conditions of balance and load distribution, would present no technical difficulty, nor indeed, going a stage further, would the calculation of the increased capital and costs for a given additional capacity in these systems. In this manner a guide to the future development of distribution costs might be obtainable.

The most useful measure of distribution efficiency is " kWh sold per £ of distribution capital " (Kennedy and Nokes, *I.E.E. Journal*, 1933). Generally speaking, greater distribution efficiency can be obtained only by increased sales of kWh by the use of the

same capital. This increased sale may be expected either by improved load factor, or by loading existing plant to its full capacity, load factor remaining constant. The relation between Fig. 1 (*b*) and (*c*) indicates that the load factor on the distribution plant falls slightly from about 27 per cent at the lowest stage of development, 2·5 kW of installed load per consumer, to about 25 per cent at 10 kW per consumer. It follows that the first expectation is likely to be disappointed, apart from the use of load-limiting devices, and that the primary criterion of distribution efficiency will be how close to capacity distribution systems are run.

These points imply the necessity for ensuring that distribution systems are designed by the co-operation of the distribution engineer and the commercial engineer with knowledge of probable development and loads. They further imply the necessity for building up load as rapidly as possible, bearing in mind that a number of existing distribution systems may be lightly loaded and that the cost of supplying additional capacity in a distribution system of, say, 1 kW per consumer, as an extension to an existing distribution is probably less than that of providing the same capacity in a new system.

A figure of 20 kW of installed load per consumer seems to represent about the final limit of development, and it is tempting to prolong the straight lines to this figure. A connected load of 10 kW per consumer is, however, clearly the furthest limit of significance of the straight lines. In addition 10 kW per consumer of connected load for small property, such as that dealt with, represents about the limit of development, apart from the sole use of electricity for space-heating, such as will be found in the genuinely "all-electric" house. This heating load may have characteristics appreciably different from the mixed loads dealt with.

Acknowledgments are due to Mr. D. H. Kendon, general manager of the S.W. & S. Electric Power Co., for permission to publish this information, and to colleagues who have assisted in its preparation.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

"A Universal Plug—Now"

MR. CONNELL states in his letter in your issue of August 9th "... we have now an agreed standard." I am left wondering what justification there is for the word "agreed" in the statement, for I have not heard of any consultations or any questionnaire to the industry generally. All that I know, as a member of the industry, is that a small body purporting to represent the views of the industry has decided on a certain line of action. That information came from the technical press, and was the direct cause of the article with the above title.

If, in fact, this small body does not really represent the views of a majority of the industry, then the net result will be that in due course—probably two or three years from now—another type of plug will be added to the "57 or more varieties" that are mentioned by Mr. Connell—for a standard can only become effective by general agreement.

He asks me to wait a few more months. I make bold to state that it will more likely be a few more years before the now proposed B.S.I. standard will be produced in quantity. So far as I am aware, even the draft of the B.S.I. Specification is not yet issued. When it is, if my experience of such matters is any guide, it will travel to and fro between the B.S.I. and other parties for months before it is finally agreed. When it is finally agreed and published, the various factories will have to be tooled up to produce in quantities of millions per year. It seems quite certain that the public would have to wait for some years before their demands could be supplied, and in the meantime the biggest housing programme in history is proceeding—necessitating the installation of many hundreds of thousands—if not millions—of what will become non-standard plugs. The only reason which would justify this delay is that there is no satisfactory plug available now. I am of the opinion that there is one available—*now*. Hence the article.

I am extremely doubtful whether any real improvement could be effected, and when allied to that doubt is the certainty that a very considerable delay will inevitably result if the

present B.S.I. proposals are proceeded with, it seemed to me that the proposals should be challenged and stopped.

I still have a lively recollection of the "lobbying" I was subjected to by manufacturing interests when the I.M.E.A. considered the plug question in the 1930's and I cannot help feeling that the representatives of the electricity supply industry dealing with this matter have been subjected to similar "lobbying."

This is a matter in which the needs of the electricity consumer should dominate and manufacturing interests be subordinate. The present proposals reverse that order. Why delay when it is very doubtful indeed if any good purpose is served by delay?

"PLAIN ENGINEER."

Unsafe Installations

WITH regard to the inspection of installations, the supply authority is certainly not the best for this work, the responsibility for which usually devolves on the meter fixer, and it is not infrequent to find that his technical knowledge is not of a sufficiently high order.

The writer recalls a case where the meter fixer of one of the largest undertakings in a suburban area, presumably unaccustomed to a reasonably good class of workmanship, was very loth to connect an installation of some twenty-three 3-kW general-purpose plugs which showed an "infinity" test at the main switch. He explained somewhat acidly that something "must be wrong" either with continuity or final earthing. The installation being of the "part ring main" variety, the writer had to show him how to test for continuity.

Would not the fire or life insurance companies be a good medium for this work? Apart from the consumer, they are probably the most interested bodies.

*London, W.*1. P.L. PULVER, A.M.I.E.E.

I AGREE with Mr. Milne that the sooner arguments on the above stop, the better, in order to safeguard the public and the better type of contractor against those who know no law but expediency, but they will continue so long as electrical contractors refuse to put their own house in order and are content to allow others to do what is in fact illegal.

Naturally registration in itself would no more protect the public against "quackery" than can the B.M.A. but it would go a long way.

Cf

My argument is that as the law stands now, power suppliers have no right or duty to carry out an inspection and it will perhaps put the matter in its proper perspective when I suggest that the present position has arisen because the public would rather trust the supplier than the contractor, and because the contractor prefers letting someone else protect him gratis, to forming his own protective organization which would of course involve some expenditure.

I would like to point out that this correspondence was opened on this occasion by a contractor who thought that power companies were wrong in preferring to carry out their real function rather than one which is solely (and "logically"—vide Mr. Milne) the concern of the contractors themselves! It is with this attitude and not with the necessity of safeguarding the public that I join issue, and I am certain that any steps to increase security would have wholehearted support from supply people.

Sheffield, 6. D. H. BRAID.

MANY views have been expressed relative to unsafe installations but in my opinion none has hit the right point. I have been in the trade for thirty-seven years and my position as chargehand, foreman, etc., has convinced me of two things: (*a*) That some employers do not worry over the way an installation is carried out if it comes out right on the financial side and (*b*) that some tradesmen to-day are satisfied if an installation just passes the tests of the corporations and consulting engineers. Their craftsmanship is nil; their desire to work for the £ s. d. side is first and foremost.

The (*a*) employers find their men in (*b*) category; the good craftsman is considered to take too long on his job and is therefore considered totally unsuitable for the get-rich-quick contractor.

It is just as easy to do right as it is to do wrong. Mr. Alex. Milne, to my mind, has hit the nail on the head when he says that compliance with I.E.E. Rules would suffice to keep things in order, but who will enforce these?

Bacup. J. ROSE.

James Watt Steam Engine

A three-ton cast-iron cylinder made by Carron Company to James Watt's orders, and the sole remaining relic of his first steam engine, is incorporated in a memorial to Watt which was unveiled at Kinneil Palace, Bo'ness, on August 3rd.

NEW BOOKS

Radio Questions and Answers. Domestic Equipment Design.

Radio Communications. By W. T. Perkins and R. W. Barton. Pp. 312; Figs. 184. George Newnes, Ltd., Tower House, Southampton Street, W.C.2. Price 12s. 6d.

This is primarily a manual of the " question and answer " type, intended for students preparing for the City and Guilds of London Institute examinations in radio communications, Grades I, II and III. It should therefore be regarded as supplementary to the usual type of textbook and/or classwork. The book opens, appropriately enough, with a syllabus for the above examinations, followed by seventeen pages of useful formulae.

Each question, printed in bold type, is followed by a model answer, and questions have been grouped under eleven chapter headings. Following these chapters is one detailing twenty-two experiments, mainly devoted to the practical determination of valve characteristics. The book is completed by a number of useful tables, nomograms, valve base diagrams, etc.

For the student who is not skilled in examination question answering (however good his theoretical knowledge may be) a book of this nature is a useful adjunct to his ordinary studies. It indicates how his knowledge must be applied to the answering of particular questions in a concise, clear and adequate manner.

A perusal of the book in question, however, shows a number of slips, and gives the impression of hurried preparation. Most of these are of a minor nature, and will no doubt be corrected in any future edition. The student is apt to be confused by the abbreviations R/F and H/F apparently used indiscriminately to signify " radio frequency "; Kc/s is used in place of the standard kc/s; μF and μf are both used on the same page; and a transposition of blocks for figs. 50 and 51 has occurred. Fig. 138 shows an electrostatic deflection cathode-ray tube with the deflecting plates between the two anodes, and although this arrangement has been used, the more standard practice is, of course, for the order to be: first anode, second anode, deflector plates. Fig. 53 shows a heptode (" pentagrid ") valve in which the first grid is marked " triode screen grid," instead of " triode control grid." Small points like these would not confuse the experienced reader, but the student may very conceivably be misled.—W.E.M.

Housing Digest. Pp. 106. Illustrated. Art & Educational Publishers, Ltd., 54, Bloomsbury Street, London, W.C.1. Price 15s.

None of the post-war problems has created so much general interest as the question of housing, particularly with regard to the design, layout and equipment. Reports on every aspect of the subject which have been prepared by various organizations have become so voluminous that the need for a compilation of the views of these organizations, which would be useful as a book of reference to authorities dealing with housing, has become a necessity.

With this object in view the Electrical Association for Women has followed up its interim report on post-war reconstruction, published in 1943, by sponsoring " Housing Digest," an analysis of Housing Reports from 1941 to 1945. As Miss C. Haslett, Director of the E.A.W. says in a foreword to the book, although the Association stands for the use of electricity for all domestic purposes, and in no way abates its own views on this subject, the compilation of quotations from reports could only be of the greatest value to the public if reference was included to equipment for all fuels.

At the request of the E.A.W. therefore, the book has been prepared by the Association for Planning and Regional Reconstruction, as an unbiased authority, and it contains a wealth of information regarding the construction of houses from the point of view of education, health, amenities and communal life. The contents include sections dealing with standards of housing, construction, equipment, design and smoke abatement; training for home management; types of houses; siting; public services; internal planning; and the kitchen and service rooms. The book will prove an invaluable work of reference to recommended practice in this country.—H.B.

Journal of the Electrodepositors' Technical Society. Vol. XX. Pp. 217, with index; 27, Islington High Street, London, N.1. Price 21s.

This cloth bound collection of fifteen technical papers presented during the 1943-44 session in London and at the Midlands Centre includes communications from the Armament Research Department (formerly Woolwich Arsenal) and nine discussions. Among the subjects dealt with is the use of electrography for the examination of deposits and a simple magnetic tester is described for determining the thickness of coatings.—W.O.F.

T.V.A. Points the Way (16 pp.) Welsh Party Offices, Caernarvon. Price 6d.

This pamphlet, by the authors of " Plan Electricity for Wales " and " T.V.A. for Wales," is a further attempt to show that the electrical side of the Tennessee Valley Authority is conducted on economic lines and that similar methods could be adopted in the development of Welsh resources.—J.H.C.

Book Received

A Handbook of Telecommunication. By B. S. Cohen. Pp. 437; figs 281; index. Sir Isaac Pitman & Sons, Ltd. Price 30s.

Standard Overhead Lines

Main Particulars of B.S. 1320 : 1946

WITH a view to securing an improved performance of wood-pole lines accompanied by lower capital and maintenance costs, the British Standards Institution has this week issued at 10s. 6d., post free, a Specification of 47 pages, B.S. 1320. This covers three-phase and single-phase high-voltage lines up to and including 11 kV with copper conductors not exceeding 0·05 sq in.—one of the two recommended sizes, the other being 0·025 sq in.: the use of other conductors is not, however, precluded. Leading features of the design are that the metal-work supporting the insulators is unearthed and that the conductors are spaced horizontally.

The factor of safety required for conductors is 2·5 with a wind loading of 16 lb per sq ft (equivalent to a continuous wind of 70 m.p.h.). For imported red-fir poles the figure is 2·5 and for larch or home-grown red fir it is 3·5. The minimum diameter of pole is 6½ in. at 5 ft from the butt; the loading point is 6 in. above pole top and the modulus of rupture 7,800 lb per sq in. Other factors of safety are 3·0 for wooden cross-arms, cross-arm struts and stay insulators and 2·5 for steel components, excluding insulator pins.

Minimum Heights

Conductors will be at a minimum height from the ground of 17 ft at 122 deg F, except at road crossings, where 20 ft is required without further precautions, at railway and canal crossings, where the Overhead Line Regulations will apply, and when crossing or in the vicinity of Post Office lines, where special requirements, given in an appendix, must be met. In the last case, the guard should be unearthed but with a modified number and disposition of the cross-lacing wires.

The Specification gives not only precise dimensions of components, but also nine tables, occupying seven pages, of conductor sags and tensions (calculated on the assumption that wooden poles are flexible supports) and other data to assist design and also 47 dimensioned drawings occupying 28 pages. Two of the latter, relating to binding-in stirrup, illustrate salient features of the design.

Anti-climbing devices are not required on single poles, unless these carry transformers or remote-mechanically operated fuses or switchgear. A similar exception applies to the earthing of steelwork, the requirements for which, including an earth mat where metal (such as a switch-operating handle) has normally to be handled when the line is alive, are stated in an appendix.

Revisions of Regulations

A third appendix sets out the Electricity Commissioners' revisions (dated August 16th) of the Overhead Line Regulations and the Electricity Supply Regulations. The purport of the first is to make the Specification a statutory, but not compulsory alternative to the adoption of other designs. This is embodied in a new Regulation 20, as follows:—

> "Overhead lines may be erected in accordance with Specification No. 1320, dated August, 1946, issued by the British Standards Institution or any modification thereof for the time being current and in so far as the requirements of the said Specification are inconsistent with or repugnant to any of the foregoing Regulations or the Electricity Supply Regulations, 1937, the requirements of the Specification shall prevail: provided that save as aforesaid and in all other respects overhead lines so erected shall comply with the provision of the said Regulations so far as applicable."

The second makes it clear that the obligation for the standard of construction to be not lower than that prescribed in the appropriate B.S. does not apply to any type of overhead line. This is done by the insertion after the words "electric lines" in Regulation 12, as amended on July 8th, 1940, the words "(other than overhead lines)." Although these revisions will obviate the necessity of sending detailed technical particulars and drawings to the Electricity Commissioners for approval in each case for lines that are constructed to the new Specification, they do not alter the existing statutory procedure for obtaining the consent of the Minister of Fuel and Power to erect a line along a specified route.

In effect the new Specification consolidates

the relaxations of the Overhead Line Regulations named in the Electricity Commissioners' circular letters of September 24th, 1937, and September 16th, 1942, but extended to include line conductors up to 0·05 sq in. It also embodies the results of the work of the Electrical Research Association, which early in 1939 drafted a preliminary specification, in accordance with which the Shropshire, Worcestershire & Staffordshire Electric Power Co. erected a number of lines for trial purposes.

Transportable Steam Boiler

Development of a Wartime Conception

THE needs of devastated areas in Russia and elsewhere inspired the wartime conception of transportable power stations to provide emergency supplies of electric power, but such plant has possibilities beyond its wartime uses. International Combustion, Ltd. has taken a leading part in the design, development and construction of a steam generating unit to meet requirements on developing sites and in localities (at home and abroad) where power supply is not immediately available.

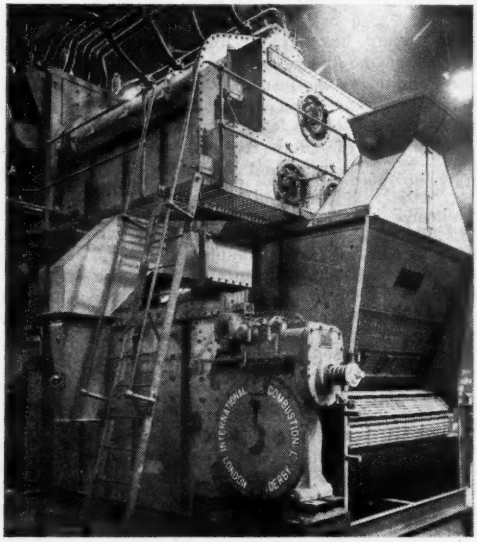
The plant consists of a two-drum water-tube boiler with all the usual equipment and water-conditioning apparatus for an evaporative capacity of approximately 35,000 lb of steam per hour, arranged for oil, coal, or dual firing in a combustion chamber which is built over the stoker. The latter is of the louvre type and the oil burners are mounted on the front casing. An economizer is included and a superheater of the horizontal grid-iron type gives a final steam temperature of 680 deg F, while saturated steam is available for the evaporators and other auxiliary plant.

The boiler is transported to the site on rail or road vehicles, in five sections with supporting steelwork. The sections are of a size conforming to the Berne international loading gauge: none exceeds 25 tons. The five sections are stoker, lower portion of supporting structure, combustion chamber, pressure parts and economizer. Each section is designed for handling into place by an erection structure which is provided.

A portable conveyor is included for feeding coal into the stoker hopper and the oil fuel equipment comprises a complete set of pumping and heating units with storage and settling tanks, so that fuel can be taken directly from tank wagons brought alongside.

The 2,500-kW directly coupled turbo-alternator, complete with condenser and air ejectors, is mounted on a common girder structure. It weighs about sixty tons, but can pass the international loading gauge on a low-loading wagon. Alternatively, road wheels can be fitted to the girder structure.

The complete plant is designed to operate, if required, without weather protection in the early stages of construction of new factories or trading estates and, moreover, can be quickly transferred from one site to another according to the power needs of an extended erection programme. International Combustion, Ltd. is prepared to supply boiler plants of the transportable type suitable for turbo-alternator outputs of up to 5,000 kW, which at present seems to represent the limit of the transportable plant.



Self-contained transportable steam boiler plant

I.E.E. Western Centre

THE programme for the first half of the next session commences on October 7th with an address by the chairman, Mr. R. W. Biles, at the University Physics Laboratory, Bristol. Further meetings are to be held at Gloucester, October 28th; South Wales Institute of Engineers, Cardiff, November 11th; and Bristol, December 9th. All meetings are to be held Monday evenings, commencing at 5 p.m.

PERSONAL and SOCIAL

News of Men and Women of the Industry

OVER 600 people attended the first annual sports day of the new factory of Hoover, Ltd., at Cambuslang, Glasgow, held in the local Somervell Park on August 10th. Among those who attended were **Mr. W. C. Puckey,** director and general works manager of the company, and several senior executives from the main factory at Perivale, Middlesex. Prizes were presented by **Mrs. J. T. Simmons,** and the day was rounded off with a gala dance until midnight in the factory canteen.

Mr. J. Huntington has retired from his position as joint managing director of the Simplex Electric Co., Ltd. He will, however, retain his seat on the board. Mr. Huntington has been associated with the Simplex concern for forty-six years, and has played a considerable part in its development from the original Simplex Conduit Co. to the present extensive electrical appliances manufacturing organization of the Tube Investments group.

The Simplex Electric Co., Ltd., has announced the following appointments which took effect from August 1st:—**Mr. J. M. Surrall,** general commercial manager, responsible for all trading departments within the company; **Mr. F. G. Arnott,** general sales manager (Installation Division), who will for the time being work from the company's London office at Tottenham Court Road; and **Mr. E. G. Plucknett,** general sales manager (Creda Division). Mr. Plucknett returns to the electrical industry after an absence of five years in the Middle East, where he saw active service with the Corps of Royal Engineers, and for two and a half years held the appointment of Chief Administrative Executive M.E. to the U.K.C.C. on loan from the Army.

Mr. J. H. Dunbar, a director of the Lancashire Dynamo & Crypto, Ltd., has been appointed assistant managing director. Mr. Dunbar has recently returned from a business visit to Canada. **Mr. H. W. Bosworth,** managing director of the company, has been appointed a director of the Nevelin Electric Co., Ltd.

Mr. G. E. Walker has been appointed secretary of Associated Electrical Industries, Ltd., in succession to **Mr. R. H. Haviland** who has retired but will be available in an advisory capacity until the end of the year. As secretary of the Metropolitan-Vickers Electrical Co., Ltd., Mr. Haviland is succeeded by **Mr. J. G. Lowe,** who in addition retains the position of comptroller.

Lt. Col. E. G. Bowers, M.C., M.I.E.E., went on leave preparatory to retirement from service with the Madras Port Trust at the end of last month. After active service in the 1914-1918 war he joined the Bombay Port Trust with whom he served from 1921 till he joined the Madras Port Trust in 1928. He occupied the post of mechanical and electrical engineer in Madras from 1928 till 1941 when he proceeded on service in India, subsequently being specially recalled in 1944 to return to the Trust as executive engineer during the period of preparation for the assault on Burma and the Far East.

Mr. G. S. Boyd, chief engineer of the Sydney County Council electricity undertaking, N.S.W., has been appointed general manager for six months following the death of Mr. D. J. Nolan. Mr. Boyd, who is sixty-one, has been in the service of the undertaking for forty-two years.

Mr. J. E. Parton has resigned his appointment as senior scientific officer with the British Iron & Steel Research Association, to become lecturer in electrical engineering at Glasgow University.

Mr. W. A. Burke, M.P., Assistant Postmaster-General, and **Mr. A. J. Gill,** Post Office Deputy Engineer-in-Chief, have gone to the United States and Canada for a month to study the telephone and telegraph services.

Mr. I. M. E. Aitken, B.Sc., M.I.E.E., A.Inst.W.E., has been appointed chief mechanical and electrical engineer to Brian Colquhoun & Partners, consulting engineers. Mr. Aitken was previously chief engineer to the Tinplate Co., of India, Ltd., Bihar, India. He was this year's recipient of the Herbert Lapworth Medal and an Institution Premium from the Institution of Water Engineers.

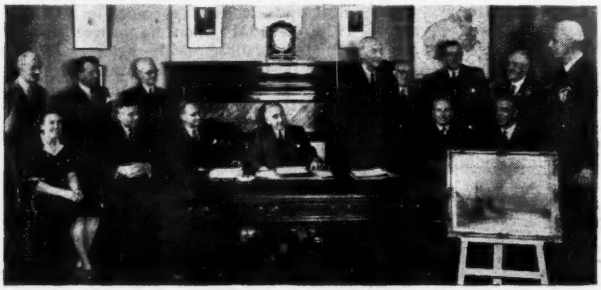
Mr. T. C. Bond, general manager of Furse Wholesale, Ltd., has been appointed a director of the company.

Councillor W. J. Tudor, of Birkenhead, has been elected by ballot general secretary of the National Union of Enginemen, Firemen and Electrical Workers. The retiring general secretary is **Mr. I. J. Hayward.** Mr. Tudor takes up his new appointment in October.

To celebrate forty-seven years' service of **Mr. C. R. Norton** with H. Snuggs & Co., Ltd., wholesale ironmongers and electrical factors, the directors and staff visited the London Palladium and afterwards attended a dinner on August 14th. A silver cigarette case was presented to Mr. Norton by his colleagues.

The Sheffield City Council has now confirmed the appointment of **Mr. A. Haddock,** B.Sc., M.I.E.E., distribution engineer as distribution engineer and sales manager, at a salary of £1,050 per annum plus cost-of-living bonus of £60 rising by two increments to a total of £1,310, and of **Mr. W. E. B. Nettleton,** A.M.I.E.E., chief distribution assistant as deputy distribution engineer at a salary in accordance with Class M, Grade 5 of the N.J.B. Schedule, at present £794 per annum

rising to £829 per annum. Mr. Haddock was educated at Leeds University, where he took first class honours in electrical engineering, and was with the Yorkshire Electric Power Co. for nine years before going to Sheffield in 1936. He is chairman of the Sheffield Sub-Centre of the I.E.E. Mr. Nettleton was educated at Manchester College of Technology. He was with Salford Corporation Electricity Department for thirteen years previous to which he was with the Metropolitan-Vickers Electrical Co., Ltd. He went to Sheffield in 1938.



The presentation to Mr. C. D. Taite upon his retirement from the L.E.P. Co.

Councillor L. F. A. Driscoll, M.I.E.E., of Newport, has been appointed Divisional Electrical Engineer to the Great Western Railway in the Swansea Division. He is at present Assistant Divisional Engineer to the G.W.R., responsible for the company's docks at Newport, Cardiff, Penarth and Barry.

Mr. J. Baggs has been appointed to the sales organization of the G.E.C. in Manchester as industrial electronic instrument engineer for the north-west area. For the past eight years Mr. Baggs has been responsible for test and inspection to Government requirements of electronic equipment at the company's instrument works, Salford, in addition to being publicity manager of these works.

Mr. E. A. Logan is shortly retiring from the position of chief electrical engineer and manager at Erith to take up the appointment of chief engineer and manager in the Electricity Supply Division of the Government of Burma. The Erith Corporation is advertising in this issue for a successor at a salary of £1,324 plus cost-of-living bonus and car allowance.

On August 9th before a gathering of staff representing all departments of the Lancashire Electric Power Co., presided over by Mr. M. H. Adams, chief engineer and manager, a presentation was made to **Mr. C. D. Taite,** whose retirement at the conclusion of nearly forty years' leadership of the company we have already announced. Mr. Adams spoke of Mr. Taite's achievement in building up the company and asked him to accept a framed picture as a token of affection and regard. Other tributes came from Mr. S. M. Rix, secretary and assistant manager, Mr. O. Howarth, sales manager and technical adviser, Mr. R. Watson Smyth, generation engineer, and Miss E. Hammond, representing the lady members of the staff. Mr. R. C. Leslie, mains superintendent, who had the longest term of service (nearly forty years) under Mr. Taite, made the presentation.

In the course of his reply, Mr. Taite said that in the uphill days, and later, he had been fortunate in having with him men of marked ability who had given of their best to the company and enabled it to do its job. A public utility company was an undertaking which in the main should be working for the public, and by the public he meant the councils and industrialists as well as the individual small consumer. He thanked everyone for their kindness during his long period with the company, and expressed appreciation on behalf of Mrs. Taite and himself for the picture.

Obituary

Mr. E. S. Saunders.—We learn with regret of the death, on August 13th, of Mr. Edgar Stopford Saunders, O.B.E., M.I.E.E., who until his retirement in 1941 was district officer at Surbiton and area engineer to the London and Home Counties J.E.A. Mr. Saunders was born in India in 1876 and was educated at Dulwich College and the Central Technical College, South Kensington. After serving an apprenticeship with Crompton & Co., Chelmsford(1896-99) he became electrical superintendent at Bradford in 1899 and two years later joined the staff of the London office of the British Westinghouse Co. From 1904 to 1907 he was with Guest, Keen & Nettlefolds, Ltd., at their Dowlais works. He went to Siemens Bros. & Co. at Sheffield in 1907 and from 1910 to 1915 was general manager for that company in India, Burma and Ceylon. During the 1914-18 war he served in the R.A.F. and was awarded the O.B.E. In the recent war he held a post in the Ministry of Aircraft Production.

Mr. S. V. Williams.—We reported last week the death of Mr. Stanley Vaughan Williams, chief metallurgist at the G.E.C. Research Laboratories, Wembley. Mr. Williams had been with the company since 1924; he took over the leadership of the metallurgical group in 1938. He was a member of the Institute of Metals and was recently elected a fellow of the Institution of Metallurgy. He had also recently

been appointed chairman of the London Local Group of the Institute of Metals. His other activities included membership of the Development Committee of the British Cast Iron Research Association and of various sub-committees of the British Non-Ferrous Metals Association.

Mr. W. Thomson-Edgar.—We regret to learn of the death of Mr. William Thomson-Edgar, chairman of the Horstmann Gear Co., Ltd., which occurred at Bath on August 11th at the age of seventy-six. The younger son of the late John Edgar of Dumfries, Mr. Thomson-Edgar married Miss Pauline Horstmann of Bath. He was chairman of the company and had been a director since its inception in 1904. During the war he acted as Controller of Emergency Food Stores for the north-eastern rural districts of Bath.

Mr. A. van Rood, hospitality officer to Marconi's Wireless Telegraph Co., Ltd., for the past twenty-three years, died on August 13th at the age of fifty-five.

Will.—**Mr. Albert George Bruty,** M.I.E.E., of Craan, Greystones, Co. Wicklow, managing director of A. G. Bruty, Ltd., and past-president of the Electrical Contractors' Association, who died on May 9th, left estate in England and Eire valued at £14,565.

Town and Country Planning

Utilities and Compulsory Purchase of Land

By Leslie F. Stemp, B.A., LL.B., *Barrister-at-Law*

DURING the next few years planning authorities will be faced with the almost stupendous task of clearing areas of "extensive war damage" and making provision for the resettlement of the population. Obviously this will make it necessary for them to exercise the powers of compulsory purchase conferred upon them by the Town and Country Planning Act, 1944. The effect of such powers upon public utility undertakings may be serious. In the first place land held by them for the purpose of carrying on their undertakings may be situated in an area to be purchased, and secondly, the redevelopment of an area may render part of an undertaking's distribution system redundant.

It follows that public utilities should maintain close contact with their appropriate planning authorities, the most satisfactory course being for the planning authority to call representatives of the utilities supplying the area into preliminary consultation in order to ensure from the start that proposals put forward are such as to commend themselves to all parties. Where this is done it may be unnecessary for the utilities to invoke the cumbersome and, no doubt, costly procedure laid down in the Act, and good and friendly relations between all parties will not be jeopardized. So great are the advantages of preliminary consultation that where steps are not taken to that end by the planning authority on its own initiative, public utilities might well consider whether they should not request the authority so to do. Such a request would be stronger, and the ensuing consultations more satisfactory, if all the utilities in the area acted together in the matter.

The first step to be taken by a planning authority under the Act is to obtain from the Minister of Town and Country Planning an Order designating the area specified in the Order as land subject to compulsory purchase. Such an Order does not itself authorize compulsory purchase, but is in the nature of a declaration that at a subsequent date a Compulsory Purchase Order will be made in respect of the area. The planning authority must advertise by *Gazette* and local advertisement that an application will be made to the Minister for the Order and the advertisement must specify the time (not being less than twenty-eight days from the first local advertisement) within which objections may be made.

If the area designated includes land held by statutory undertakers for the purpose of carrying on their undertakings, they should as soon as possible after the appearance of the advertisement make representations to their appropriate Minister (in the case of electricity, the Minister of Fuel and Power) under Section 13 (5a) of the Act. The form of such representation is laid down in Form 4 of the Town and Country Planning Act, 1944 (Particulars and Forms of Orders and Notices) Regulations, 1945 No. 1036.

Where such a representation is received from an electricity undertaking, the Minister of Town and Country Planning and the Minister of Fuel and Power may take one of the two following courses:—

(1) They may make an Order declaring

that it is expedient that the land should be subject to compulsory purchase. Such an Order will be subject to special Parliamentary procedure under the Statutory Orders (Special Procedure) Act, 1945, and the undertakings will, therefore, have the right to object to the Order in Parliament. If the Order is confirmed by Parliament, the effect will not be to transfer the ownership of the land to the planning authority. The authority may, however, include the land in a subsequent Compulsory Purchase Order under Section 2 and the undertaking will not be able to claim the exclusion of the land from the Order under the provisions of Section 13 (3) of the Act. Whether on the acquisition of the land the special provisions of Schedule 4 of the Act regarding the assessment of compensation to statutory undertakings will be available in such cases is a point of some doubt. While from Section 13 (6) this would appear to be the case, the Schedule itself is said to apply only in the case of a purchase under Section 10 (4).

(2) The two Ministers may refuse to make an Order declaring the land to be subject to compulsory purchase. The effect of this will not be to exclude the land from the Declaratory Order: it will, however, be possible when the planning authority applies for a Compulsory Purchase Order under the section for the affected undertaking to take advantage of the provisions of Section 13 (3) of the Act.

Representations to Minister

Immediately an application is made for a Compulsory Purchase Order, the undertaking should make representations to the Minister of Fuel and Power in accordance with Form 11 of the Particulars and Forms of Orders and Notices Regulations that its land should be excluded from the Order. On proving that the land is used for the purposes of carrying on the undertaking, and that it is not land which is " in respect of its nature and situation comparable rather with the generality of land" to which the Order applies rather than with the operational land of a public utility, the land must be excluded from the Compulsory Purchase Order.

If the planning authority still desires to purchase the land, it must apply in accordance with Form 12 to the Minister of Town and Country Planning and to the Minister of Fuel and Power for an Order under Section 10 (4). If such an Order is made it is subject to special Parliamentary procedure, which again will give the undertakings an opportunity to have their case stated in Parliament. If compulsory powers are obtained by the planning authority, the compensation in such a case will clearly be assessable in accordance with Schedule 4.

The provisions of the Act as outlined above are admittedly cumbersome. It was impossible in the interests of town and country planning to obtain absolute exclusion of operational land from the provisions of the Act. The matter was the subject of careful consideration by the Inter-Departmental Committee over which Sir David Maxwell-Fyfe presided, so the conclusions of the Committee, which have largely been embodied in the Act, may be regarded as a fair compromise of a difficult question.

Electric Sorting

DETAILS of a number of electric sorting devices now being used in the United States in all kinds of industries are given in the " McGraw Hill Digest." For sorting out the bad from the good in such foodstuffs as beans, peanuts, coffee, seed corn and potatoes light from a lamp is reflected by the article being inspected through the lens to a partial mirror, which reflects half of the light through a red filter to a red-sensitive photo-electric cell and transmits half to a second mirror, which reflects it through a green filter to a green-sensitive cell. The outputs of the photo-electric cells are amplified and fed to the deflection plates of a cathode-ray tube to control the horizontal and vertical sweeps of the electron beam. A bad article throws the beam outside a partial mask on the tube to actuate a rejector.

Photo-electric cells are also being used to detect minute particles of foreign matter, even when transparent, in mineral waters at a production-line speed of 140 bottles a minute. A ray of light passing through the filled bottles actuates a photo-electric cell which in turn operates a rejector. Yet a further application is to be found in the Ford factories for testing hot-metal samples. Here two pieces of each sample are placed end-to-end in a holder to pass a 35-kV spark for 45 seconds. The heated sample radiates light, which is colour separated by a prism. Percentages of an element in the sample are determined automatically by a photo-electric cell which magnifies radiation 200,000 times and then records the intensity, rather than the colour, on a meter.

A Wheatstone bridge type of circuit is employed for another type of sorter used for grading ball and roller bearings in five sizes, plus " under " and " over " rejects, with a selectivity of 40 millionths of an inch at a rate of two a second. A feeler touches the bearings as they roll under it, solenoids opening stops to direct the balls into the appropriate bins.

Submarine-Cable Fault

Method of Localization

By M. Datta, *M.Sc.Tech., A.M.I.E.E.*

UNDER service conditions difficulties are sometimes experienced in localizing an open-circuit fault with very low resistance to earth. The usual capacitance test cannot be used in such circumstances, and the inductance-bridge method using audio-frequency current might still be considered a refinement more suited for laboratory work.

The author received a request from a supply company in India for assistance in locating a fault of this nature on a 6·6-kV submarine cable which linked-up the power station on one side of a wide river with a substation on the other side. The cable was a three-core 0·0225 sq in. conductor insulated with impregnated paper, lead-sheathed, jute-served and double-wire armoured. Except for a short distance on each end, the cable was submerged in saline water at a depth of about 120 to 150 ft. The route length was 800 yd, and the resistance of each core was 0·111 ohm per 100 yd.

Conductor resistance measurements carried out from each end of the cable, using a bridge "Megger," are shown in the accompanying table. Red, blue and yellow are the core colours, and the second set of figures in the last column are repeat tests taken after a short time interval.

Core Colours	Measured Resistances — Ohms.			
	With loop at the remote (substation) end	From power-house end with substation end open-circuited	From the substation end with power-house end open-circuited	
Red-sheath ..		1,540	17,000	
Blue-sheath		2,640	15,000	
Yellow-sheath		1·4	18,000	
Red–Blue ..	4,000	5,000	12,000	20,000
Blue–Yellow	4,500	4,400	2,000	2,000
Red–Yellow	2,660	3,500	12,000	25,000

Resistances of the blue-yellow and red-blue loops were higher than the red-yellow, approximating to open-circuit conditions, and all were greatly in excess of the calculated value, viz.: 2R = 1·76 ohms. When resistances were measured from the substation and with the power-house end open-circuited, red-blue and red-yellow appeared to be considerably greater and were variable.

Evidently the red conductor had an almost complete break; the resistances between each of the cores and the sheath showed that the dielectric of the yellow core had deteriorated, resulting in a low-resistance fault to the sheath. A low-resistance earth fault was also present on one of the cores, but the insulation resistance between the cores was comparatively high and each had high-resistance breaks, probably due to the burn-out at the time the fault developed (Fig. 1).

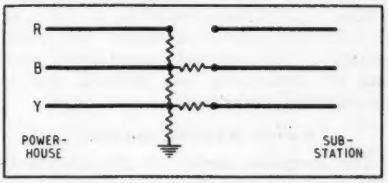


Fig. 1

In view of the limited time and equipment available, a rapid method of localization giving a reasonably accurate result was considered preferable to an elaborate procedure involving various refinements which might give greater accuracy but which would delay the operation. A modified fall-of-potential test was devised and applied to the faulty core by running a pilot wire of 3/20 v.i.r. cable across the river to connect the far end of the cable with the substation earth lead (Fig. 2).

A 6-V battery was used to pass a steady current through the fault to earth via the return loop set up. If V be voltmeter reading to earth at the near end of the faulty cable with a current I flowing, then: $\frac{V}{I} = X + f$, where X = resistance of the conductor from the power-house end to the fault and f = fault resistance to earth from power-house end, the two being in series.

Knowing the value of f, the value of X can be found from the reading of the voltmeter and the ammeter. The actual fault position at a distance F from the power-house end is a proportion of the total length (800 yd) in the ratio of X: R (R being the resistance of the conductor). Therefore,

$F = \frac{X}{R} \times 800$ yd. The calculated resistance, R, for an 800-yd length of the cable conductor was 0·88 ohm. Ammeter and voltmeter readings for the Fig. 2 circuit were 99 mA and 338 mV; 85·3 mA and 302 mV; 89·5 mA and 316 mV. The average resistance calculated from these readings is approximately 3·4 ohms.

The measured earth resistance of the yellow core at the fault was 2·2 ohms, and that of the substation earth at the far end was 0·6 ohm, so that f is 2·8 ohms, and X is 0·6 ohm. As the normal conductor resistance was about 0·111 ohm per 100 yd, the fault was suspected to be about 600 yd from the power-house end, or 200 yd from the substation end. Subsequent lifting of the cable showed that the localization was fairly accurate. The cable was twisted at this place and the armouring was severed, due to unauthorized anchorage.

Factors Affecting Accuracy

The foregoing method is not necessarily the most accurate one, as proportionality calculations of this type, which are based on conductor resistance and cable length, depend upon the accuracy to which these properties are known, also on the magnitude and stability of the fault resistance. On an installation of this kind, appreciable temperature differences may exist between parts of the cable laid underground or in water so that the resistance per unit length of the cable is not constant, thus introducing errors. However, bearing in mind the limited apparatus available, the result can be regarded as satisfactory.

Subsequent inquiries, and a study of literature on the subject of fault localization, suggest that equally good or possibly better results might have been obtained by employing some form of "search" method*, and the following notes deal with search methods applied under somewhat similar circumstances.

Use of Search Coil

Exploration of the magnetic field in the vicinity of a faulty cable carrying a tracer current (introduced by interrupted d.c. or a.c.) by means of a search coil is fairly well known for cables installed in the ground or in ducts. A description has been published† of the application of this principle to localization of a fault in a submarine power cable. The search coil was wound on a long laminated steel core enclosed in a waterproof casing giving a bar formation, and was connected to a two-valve amplifier. It was suspended in a vertical position from a launch which travelled over the cable route, and difference in volume of sound gave the approximate fault position. After marking the location with a buoy, the cable was grappled and raised, final exact localization being carried out with a small sector-shaped coil and headphones.

A modification of this method is known to have been used on another faulty cable at a river crossing. Current from a buzzer on the shore was passed through the faulty core, returning through the water, and was detected by means of electrodes lowered over the two ends of a rowing boat, connected to a three-valve amplifier and headphones in the boat. In this case exact localization was unnecessary as a severe damage was visible as soon as the cable was lifted.

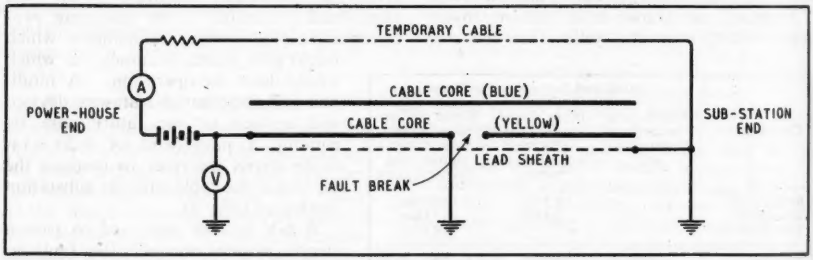


Fig. 2

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* J. H. Savage. "Localization of Faults in L.V. Cables." I.E.E. *Journal*, Part 2. December 1945.

† D. F. Tulloch. "Interruption Locates Submarine Cable Faults." *Electrical World*. August 5th, 1944.

United States Exports

Preliminary Figures for 1945

THE U.S. Department of Commerce has issued in preliminary form detailed statistics, by countries, of the export trade of the United States for 1945. The principal electrical items are shown in the following table with a note of increase or decrease in value on 1939. The only noteworthy lines in which very large increases were not recorded were certain domestic appliances and other equipment not needed in the war effort. The outstanding customer countries were Canada, the U.S.S.R., Mexico, and some other Latin American states. Argentine trade fell off. Comparison between 1939 and 1945 is affected in some cases by changes in classification and generally of course by the rise in costs.

Class of Goods	1945 $ (000)	Inc. or dec. on 1939
Generators, a.c.	2,616	+ 2,237
To Canada	631	+ 560
„ Britain	505	+ 501
„ Brazil	52	+ 15
„ India	188	+ 187
„ U.S.S.R.	1,032	+ 1,032
Generators, a.c.	993	+ 247
To India	61	− 197
„ Britain	182	+ 178
„ Mexico	181	+ 140
„ Canada	153	+ 120
„ Brazil	154	+ 91
„ U.S.S.R.	11	− 81
Steam turbo-generator sets, under 500 kW	951	+ 690
To Canada	122	+ 114
„ Mexico	211	+ 202
„ India	118	+ 116
„ Venezuela	58	+ 52
„ U.S.S.R.	334	+ 334
Ditto, 500 kW and larger	16,039	+ 13,809
To Canada	471	+ 471
„ Mexico	297	+ 289
„ Brazil	127	− 1,694
„ U.S.S.R.	13,086	+ 13,086
„ Venezuela	118	− 41
„ China	424	+ 424
„ Australia	403	+ 393
Accessories & parts for generators	6,183	+ 5,332
To Canada	447	+ 385
„ Mexico	267	+ 207
„ Brazil	264	+ 19
„ Uruguay	418	+ 417
„ Britain	503	+ 478
„ U.S.S.R.	2,326	+ 2,326
„ India	276	+ 265
„ China	831	+ 822
Welding sets	6,267	+ 5,228
To Canada	647	+ 471
„ U.S.S.R.	3,096	+ 3,073
„ Brazil	500	+ 345
„ Mexico	460	+ 409
„ Venezuela	292	+ 214
Self-contained lighting sets	5,088	+ 3,562
To Canada	894	+ 825
„ Britain	921	+ 876
„ Mexico	1,079	+ 1,032
„ U.S.S.R.	559	+ 555
Diesel electric sets	30,532	+ 30,532
To U.S.S.R.	19,925	*
„ Britain	4,484	*
Wind-driven generators	608	+ 36
To Canada	236	+ 121
„ Uruguay	79	+ 48
„ Brazil	109	+ 85
„ S. Africa	100	+ 41
Storage batteries	9,459	+ 7,053
To Canada	148	+ 52
„ Mexico	165	+ 76
„ Venezuela	143	+ 33
„ U.S.S.R.	197	+ 195
„ India	1,970	+ 1,798
„ Britain	2,975	+ 2,888
Other batteries, including flashlight	6,622	+ 3,006
To Britain	1,019	− 28
„ India	1,242	+ 572
„ U.S.S.R.	985	+ 985
Power transformers over 500 kVA	2,705	+ 1,911
To Mexico	259	+ 253
„ Brazil	285	+ 32
„ Chile	225	− 209
„ U.S.S.R.	1,360	+ 1,360
Distribution transformers 500 kVA and less	1,889	+ 1,306
To U.S.S.R.	430	+ 430
„ Mexico	505	+ 466
„ Colombia	123	+ 38
Instrument transformers	181	+ 66
To Canada	10	+ 6
„ Brazil	29	+ 12
„ Mexico	29	+ 13
Other transformers	1,056	+ 548
To Canada	115	+ 38
„ U.S.S.R.	272	+ 200
Mercury power rectifiers	359	+ 326
To U.S.S.R.	309	+ 309
Convertors	4,304	+ 3,673
To Canada	141	+ 53
„ U.S.S.R.	2,421	+ 2,361
Battery chargers, non-rotating	767	+ 512
To Canada	184	*
„ Australia	113	*
Switchboard panels, except telephone	3,456	+ 2,644
To Canada	113	+ 72
„ Brazil	511	+ 231
„ Mexico	376	+ 285
„ U.S.S.R.	1,125	+ 1,125
Circuit breakers and switches over 10A	3,905	+ 2,326
To Canada	1,174	+ 940
„ Brazil	211	− 85
„ U.S.S.R.	1,059	+ 1,058
Testing, measuring, recording and indicating instruments	11,500	+ 8,544
To Canada	1,157	+ 475
„ Australia	706	+ 591
„ India	626	+ 602
„ Britain	5,591	+ 5,311
„ U.S.S.R.	1,594	+ 1,362
Lightning arrestors, choke coils, reactors and parts	654	+ 201
To Canada	88	+ 29
„ Brazil	70	+ 19
„ U.S.S.R.	133	+ 124
„ Australia	96	+ 56
Electric locos, railway and mining	936	+ 211
To Canada	102	− 51
„ Belgian Congo	78	+ 78
„ U.S.S.R.	571	+ 571
Industrial trucks and tractors	1,567	+ 1,100
To U.S.S.R.	1,290	+ 996
„ Brazil	95	+ 71

* Comparative figures not available

United States Exports (*Continued*)

Class of Goods	1945 $ (000)	Inc. or dec. on 1939
Motors, under 1 H.P.	1,559	+ 365
To Canada	754	+ 300
„ New Zealand	45	+ 19
„ Brazil	183	+ 116
Stationary motors, 1–200 H.P.	9,061	+ 7,581
To Canada	868	+ 686
„ Mexico	1,112	+ 1,002
„ Brazil	617	+ 494
„ U.S.S.R.	4,863	+ 4,710
Ditto, over 200 H.P.	1,968	+ 1,496
To Mexico	351	+ 292
„ Brazil	192	+ 167
„ U.S.S.R.	1,142	+ 974
Starting and controlling equipment for industrial motors, and parts	4,838	+ 3,318
To Canada	1,475	+ 1,027
„ U.S.S.R.	1,601	+ 1,351
„ Mexico	490	+ 436
Accessories and parts for motors	2,576	+ 1,086
To Canada	896	+ 491
„ Iran	129	+ 126
„ India	135	+ 89
„ Mexico	224	+ 185
Portable tools, power driven	1,984	*
Portable electric tools, other	1,234	*
To Canada	667	*
„ Britain	162	*
„ Brazil	51	*
„ U.S.S.R.	28	*
Refrigerators, household	530	− 9,010
To Canada	48	− 657
„ Mexico	101	− 318
„ Brazil	81	− 808
„ Australia	58	− 320
„ New Zealand	45	− 134
Ditto, Commercial up to 1 ton	1,379	− 412
To Canada	390	+ 190
„ Venezuela	105	+ 15
„ Mexico	439	+ 381
Parts for electric refrigerators	2,767	− 3,286
To Canada	1,279	− 702
„ Mexico	152	+ 89
„ Australia	154	− 56
„ S. Africa	108	− 12
„ Brazil	175	+ 66
„ New Zealand	117	+ 59
Electric fans	197	− 405
To Canada	69	− 7
„ Mexico	25	− 7
„ India	23	− 4
Filament lamps, small	1,984	*
To Canada	218	*
„ Mexico	105	*
„ Brazil	118	*
„ Britain	304	*
„ India	484	*
„ Australia	166	*
Filament lamps, large	4,639	*
To India	1,226	*
„ S. Africa	227	*
„ Chile	358	*
„ Colombia	378	*
Flashlights	987	*
To Britain	60	*
„ S. Africa	51	*
„ Canada	326	*
„ Mexico	143	*
Fluorescent lamps	1,275	*
To Canada	113	*
„ Chile	174	*
„ Brazil	184	*
„ Uruguay	184	*
Searchlight and airport beacons	1,461	+ 1,213
To Britain	327	+ 327
„ U.S.S.R.	888	+ 888
Electric light fixtures	1,877	+ 271
To Canada	421	− 164
„ Mexico	447	+ 316

Class of Goods	1945 $ (000)	Inc. or dec. on 1939
Domestic motor-driven devices, including washing machines, vacuum cleaners and parts	455	− 3,099
To Canada	321	− 929
„ Brazil	51	+ 10
„ Mexico	23	− 781
Electric flat-irons	215	− 265
To Canada	37	− 20
„ Mexico	42	+ 7
„ S. Africa	29	− 5
Heating or cooking devices, etc.	963	− 126
To Canada	500	+ 157
„ Mexico	74	+ 7
„ Colombia	66	− 49
„ S. Africa	57	− 103
Furnaces and other industrial heating devices and parts	5,624	+ 3,934
To Canada	691	+ 406
„ Mexico	311	+ 293
„ U.S.S.R.	3,123	+ 2,226
X-ray and therapeutic apparatus and parts	8,301	+ 6,099
To Canada	1,063	− 437
„ Britain	1,047	+ 802
„ Mexico	640	+ 504
„ Brazil	939	+ 829
Radio transmitters and parts	46,310	+ 43,614
Receiving sets	4,273	− 6,179
Radio receiving valves	4,160	+ 1,159
Loudspeakers	500	− 75
Other components and accessories	8,895	*
Other telegraph and telephone apparatus and parts	19,250	+ 15,591
To Canada	2,132	+ 855
„ U.S.S.R.	9,161	+ 8,693
„ Australia	2,321	+ 2,311
„ India	752	*
Bells, buzzers and alarms	963	+ 695
To Canada	315	+ 146
„ U.S.S.R.	440	+ 440
Starting, lighting and ignition equipment	5,262	+ 4,100
To Canada	2,228	+ 1,811
„ Brazil	285	+ 213
„ Mexico	603	+ 582
„ Australia	67	+ 8
„ New Zealand	106	+ 81
„ Britain	110	+ 65
„ Venezuela	285	+ 267
Insulating material	1,345	+ 938
To Canada	655	+ 511
„ Brazil	137	+ 122
„ S. Africa	57	+ 42
Electric light fixtures, fluorescent	1,610	*
To Canada	354	*
„ Mexico	283	*
„ Venezuela	123	*
„ S. Africa	78	*
Wiring supplies and line material	2,033	+ 953
To Canada	447	*
„ Mexico	145	*
„ U.S.S.R.	442	*
„ Venezuela	149	*
Electric razors	16	− 902
To Canada	15	− 79
Other electrical apparatus	13,704	+ 3,990
To Britain	1,450	− 1,767
„ Canada	4,937	+ 2,663
„ Australia	802	+ 466
„ S. Africa	248	− 50
„ India	1,025	+ 852
„ Argentina	86	− 326
„ Brazil	664	+ 321
„ Mexico	626	+ 384
„ India	1,025	+ 852
„ Venezuela	176	+ 22
„ U.S.S.R.	1,538	+ 1,454

* Comparative figures not available

COMMERCE and INDUSTRY

Next Year's B.I.F. Tungsten and Molybdenum Imports.

British Industries Fair

IT had already been announced that the first post-war British Industries Fair was to be held in May next year. Now it is stated that the actual period of the Fair will be from May 5th to 16th. It will be held at Earl's Court and Olympia, London, and Castle Bromwich, Birmingham, the division of exhibits being much the same as in pre-war Fairs. The Export Promotion Department of the Board of Trade, 35, Old Queen Street, S.W.1, will be responsible for the London sections and the Birmingham Chamber of Commerce, 95, New Street, Birmingham, for the Castle Bromwich display.

Civilian Industries for Kidbrooke

The Board of Trade announces that six London firms have been allocated factory space for civilian production in part of the No. 1 Maintenance Unit at Kidbrooke, Kent, which is being vacated by the R.A.F. They are Foxborough Yoxall, Ltd. (makers of scientific instruments), Scientific & Projections, Ltd. (instrument and cinema equipment), Paterex, Ltd. (instruments), Brentford Transformers, Ltd., F. C. Burnard & Co., Ltd. (engineers' chucks), and J. S. Manufacturing Co., Ltd. (woodworking). Several of the firms were "blitzed" and are at present without accommodation. It is expected that employment for about 1,200 workers will be provided. These allocations, including one still to be made, represent about 150,000 sq ft of the total covered floor space of 700,000 sq ft.

Iron and Steel Price Increases

The Minister of Supply has made the Control of Iron and Steel (No. 52) Order, 1946, and the Control of Bolts, Nuts, etc. (No. 12) Order, 1946, which came into operation on August 14th. These Orders provide for higher maximum prices necessitated by increases in railway rates, coke prices, wages and other costs. The maximum prices of the main qualities of pig-iron are increased by from 4s. 6d. to 6s. 6d. per ton, and of heavy steel by 5s. per ton. Prices of more finished products have been increased where necessary by amounts which reflect the effect of the increases in pig-iron and semi-finished steel as well as the increase in direct processing and delivery costs. The Orders also free wrought iron in any form and cemented carbide hard metal tool tips from control.

Tungsten and Molybdenum Ores

Government purchase of tungsten and molybdenum ores and concentrates with the exception of small outstanding commitments has ceased and it has been decided to return to private trading in these materials. The arrangements for dealing with residual Government stocks are under consideration, but purchase and import on private account may now be resumed subject to import licence. Applications for import licences should be made on the usual form which should be forwarded to the Iron & Steel Control, Ministry of Supply, Artillery Mansions, 75, Victoria Street, London, S.W.1, for transmission to the Import Licensing Department of the Board of Trade. For the present, the Ministry will be prepared to sell material for current requirements from stocks as necessary.

Grain Handling

Investigations carried out by the British Electrical and Allied Industries Research Association to ascertain the extent to which pneumatic methods are employed in this country for conveying and elevating grain on a small scale form the subject of a Report W/T12 by A. E. Canham, 4s. 6d. A conclusion reached is that the design of these plants has generally not been based on definite scientific knowledge or on extensive preliminary research, although the scope for such equipment should be large. The direction of further research is indicated, mainly on the lines of the small units developed by the National Institute of Agricultural Engineering.

Bedford Aeronautical Station

Work has begun on clearing the site of the new Government aeronautical research station near Bedford, the cost of which will be in the region of £20,000,000. Some of the equipment is expected to be ready by 1948 and a considerable part by 1952.

Motors taken from a concealed German aeronautical establishment near Brunswick will be used for the first of the supersonic air tunnels. To provide the power to equip other tunnels, motors aggregating about 500,000 H.P. will be installed with a peak load of 200,000 H.P. The electricity supply will be taken from the Bedford Corporation undertaking.

Boiler House Instruments

Fuel Efficiency Bulletin No. 45 of the Ministry of Fuel and Power deals comprehensively in 24 pages with "The Installation and Maintenance of Boiler-House Instruments." It includes nine diagrams, which reinforce the simple and practical explanations given in the text of the functions of the instruments, their construction and possible causes of unsatisfactory operation with notes on methods of checking performance.

First Post-war Radiolympia

The Radio Industry Council announces that it is planning to hold the first post-war Radiolympia in late September or early October, 1947. Negotiations are now in train for a tenancy of Olympia for this purpose.

Electrical Exhibition at Selfridges

In continuance of their policy of holding post-war exhibitions illustrating how British industries have converted from war to peace manufacture, Selfridges are holding an electrical exhibition at their Oxford Street store from October 7th for three or four weeks. The

exhibition will show what the post-war efforts of the electrical industry are producing, and there will be sections representing room heating, water heating, commercial refrigeration, lighting, etc. Already it is anticipated that over 100 exhibitors, mostly B.E.A.M.A. members, will be taking part, but the exhibition is open to anyone in the electrical industry whose merchandise Selfridges approve as being good.

Radio Navigation of Ships

It is reported that the Ministry of Transport has arranged with the Decca Navigator Co. for experimental operational trials of the Decca system of radio navigation on board merchant ships. The Ministry of Transport has taken advantage of the existence of the chain of transmitting stations, established by the company on the Thames Estuary and North Sea for the experimental use of the Royal Navy, to test the usefulness of the system to the Mercantile Marine. The trials are expected to last some months.

Fuel-Oil Firing at Bunnerong

Following tests on fuel-oil firing to supplement coal burning at Bunnerong power station, the general manager of the Sydney County Council electricity undertaking (Mr G. S. Boyd) has recommended the installation of auxiliary fuel-oil burning equipment in station "A" at a cost of £1,300. According to the *Electrical Engineer and Merchandiser*, the results indicate that the output of this section, which has a capacity of 175,000 kW, could be increased by approximately 10 per cent by the use of fuel oil.

Municipal Trading at Eastbourne

Eastbourne Corporation Electricity Committee has decided to permit direct sales in the showrooms and discontinue the practice of allowing contractors discount on showroom sales except in cases where a prospective purchaser is introduced by a contractor, when the appropriate trade discount will be allowed.

Sale of Utensils

The Torquay Chamber of Trade has protested to the Electricity Committee against the suggested extension of municipal trading at the electricity showrooms by the sale of non-electric cooking utensils. The Committee is to receive a deputation to discuss the matter.

Minister's Visit to Scotland

The Minister of Fuel and Power, Mr. Emanuel Shinwell, has made a tour of a number of Scottish centres during the past week. The programme arranged included a visit of inspection, with the Secretary of State for Scotland, to Loch Sloy hydro-electric scheme, a visit with the Secretary of State to Tummel-Garry hydro-electric scheme, and a visit to the Dumfries County Council's electricity undertaking.

V.I.R. Wire in New Zealand

There has been some discussion among electrical associations in New Zealand regarding the use of p.v.c. insulated wire in place of v.i.r. When the subject came before the Executive Committee of the Electric Supply Authority Engineers' Association a resolution was passed expressing the opinion that those who dealt with house wiring supplies should not be prevented by any restriction on imports from continuing to handle v.i.r. wire or from recommending its use to their customers.

Water Heating at Yarmouth

As a companion to the brochure on electric water heaters recently published for circulation in the rural area, the Great Yarmouth Electricity Department has now issued a booklet for the town area. In the main the contents are the same, describing the different types of equipment available with examples of installations and suggestions for keeping heat losses to the minimum, but the costs are adjusted in view of the slightly more favourable town tariff.

Costs in Industry

We have received from McGowan, Perry & Partners, consulting industrialists, 34, Birkdale Road, London, W.5, a booklet entitled "Reducing Your Costs." It is contended that in this country, unlike the United States, cost reduction has not received the detailed attention that it deserves. The importance of the subject in relation to exports is emphasized.

Reports on German Industry

Further reports on German industry now available include the following: C.I.O.S. XXIII-14, "Turbine Engine Activity at Ernst Heinkel Aktiengesellschaft" (6s.); B.I.O.S. 563, "The German Radio Component Industry" (6s. 6d.); F.I.A.T. 229, "Copper, Lead, Zinc, Tin and Antimony Smelting and Refining in North-Western Germany" (4s. 6d.); and F.I.A.T. 413, "Tungsten and Molybdenum Wire Manufacture, for use in Lamps and Radio Tubes" (1s. 6d.).

Power Station Company Formed

The Carmarthen Bay Power Station Co., Ltd., was registered on August 6th as a public company with a capital of £100, its objects being to construct and equip an electricity generating station, etc. The directors are M. A. Edwards, W. McNeill (a director of the Llanelly & District Electric Supply Co., Ltd.) and A. S. Valentine, M.I.E.E. The registered office is at 66, Queen Street, London, E.C.4.

Technical Mission to the Caribbean

A technical mission will leave this country shortly to make a three months' tour of the oilfields and refineries in Trinidad, Venezuela and Columbia. While all the personnel of the mission are members of the Council of British Manufacturers of Petroleum Equipment, the mission is purely a private one organized and financed by the members themselves. Equipment to the value of many millions of pounds is purchased annually by the oil companies—before the war this was almost entirely an American monopoly—and the importance of the visit, therefore, cannot be stressed too greatly since its successful conclusion must have far reaching results on our export trade. Every support is being accorded the mission by the Ministry of Fuel and Power and the Export Promotion Department of the Board of

Trade, and on arrival in Trinidad a public reception will be held by the Governor General. The President of Venezuela has also expressed a wish to receive the members. The mission is under the leadership of Mr. G. R. Bolsover, director and chief metallurgist of Samuel Fox & Co., Ltd. (branch of the United Steel Co., Ltd.), and comprises the following:—Messrs. E. E. Allen (Industrial & Engineering Development Association), D. H. Carter (Head Wrightson Processes, Ltd.), A. G. Ellison (Yorkshire Copper Works), E. T. Forestier (Newman, Hender & Co., Ltd.), E. F. E. Howard (Hayward, Tyler & Co., Ltd., also representing other firms), F. Kenyon (Wm. Kenyon & Sons, Ltd.), H. Martin (Murex Welding Processes, Ltd.), E. Pritchard (British Oilfields Equipment Co.) and G. H. Thorne (Dawnays, Ltd.).

Export of Surplus Machine Tools

Removal of the two months' period during which, in the past, surplus machine tools have been on offer to British industry before being made available for export, is announced by the Ministry of Supply. The new arrangement, which comes into force immediately, has been made possible because of the increasing quantities of Government surplus machine tools becoming available. Although a limited range of the scarcer tools will not be available for export for the present, the revised procedure will free several thousand tools which can be purchased at attractive prices for resale abroad.

Machine Tool Sales

An additional selling centre for Government owned surplus machine tools will be opened at the Ministry of Supply Store, Patterson Street, Blaydon, Haughs, Blaydon-on-Tyne, on September 11th.

Sale of Radio Sets at Showrooms

Dartford Corporation Electricity Committee has asked the borough electrical engineer to report on the sale of radio and television sets at the electricity showrooms.

Fatal Accidents in Australia

According to the Commonwealth Bureau of Census and Statistics, 38 people were killed by electric shock in Australia in 1944, all but one being males. In the previous year there were 36 male and 7 female victims.

Parsons Memorial Lecture

The Parsons Memorial Lecture for 1946 will be delivered by Sir Hugh Chance at the Institution of Civil Engineers on September 26th at 5.30 p.m. and members of the I.E.E. are invited. Sir Hugh's subject will be "Recent Developments in Optical Glass Manufacture."

A.S.E.E. West London Branch

Subjects of talks to be given to the West London Branch of the Association of Supervising Electrical Engineers during the 1946-47 session include "Fractional H.P. Motors" by A. N. D. Kerr (September 3rd), "Electricity in Horticulture" by F. E. Rowlands (October 1st), "Post-War Utilization" by W. Gilchrist (November 5th), "Some Notes on the Safe Installation of Electrical Equipment" by H. F. Buxton (December 3rd), "Some Applications of Electricity and Gas" by a representative of the gas industry (January 7th), and "Mineral Insulated Sheathed Cables" by F. E. Redman (February 4th).

Contract Price Adjustment Formulæ

The latest figures for the B.E.A.M.A. contract price adjustment formulæ are as follows:—Rate of pay for adult male labour at August 10th, 103s. (no change). Cost of material: the index figure published by the Board of Trade on August 10th is 196·0 and is the figure for the month of July (compared with 192·2 for June).

Trade Announcements

Pye, Ltd., has removed its Glasgow office to 21, Waterloo Street, Glasgow (telephone: Glasgow Central 8301).

The address of the Manchester office of British Insulated Callender's Cables, Ltd., is now Faraday House, Todd Street, Manchester, 3 (telephone: Blackfriars 7044/5).

Aerialite, Ltd., has opened a sales office and showroom at 91/93, Baker Street, London, W.1 (telephone: Welbeck 7986).

Changes of Name

Hope's Heating & Lighting, Ltd., has changed its name to Henry Hope (Engineers), Ltd.

The title of the Midland Electric Co. (Leicester), Ltd., has been changed to Atlas Electric Co. (Leicester), Ltd.

Trade Publications

G.W.B. Electric Furnaces, Ltd., Dibdale Works, Dudley, Worcs.—Illustrated brochure (B.C.F.46) describing in general terms versatile belt conveyor furnaces for continuous heat treatment processing.

Runbaken Electrical Products, Ltd., 71, Oxford Road, Manchester, 1.—Illustrated and priced leaflet with manual of operating instructions relative to an auto-electrical test set for automobile and ignition servicing.

Precision Components Co., Aller, Langport, Somerset.—Illustrated and priced leaflet on "Kahi" multi-way moulded terminal blocks.

Ferranti, Ltd., Hollinwood, Lancs.—Illustrated and priced leaflet on Model 546 transportable AC/DC radio receiver in moulded white cabinet of miniature size.

Genristo, Ltd., Osmaston Street, Nottingham.—Illustrated and priced brochure on heating elements of many varieties for domestic and industrial appliances; also temperature control panels, furnace heaters and motor starter resistors.

J. H. Sankey & Son, Ltd., Refractories Works, Ilford, Essex.—Illustrated leaflet, with directions for use, on quick setting acid resisting cement which withstands high temperature.

British Aluminium Co., Ltd., Salisbury House, London Wall, E.C.2.—Brochure (No. 403) illustrated with sketch drawings, outlining the merits of steel cored aluminium conductors for

overhead power lines, including data sheets on conductors, clamping, jointing, anchoring, damping and tapping.

Gent & Co., Ltd., Faraday Works, Leicester.—Illustrated brochure describing "Tangent" fire detection, indication and alarm equipment with accessories.

[Applicants for copies of these publications should write on their firms' business notepaper.]

Municipal Reports

Stoke-on-Trent

COMPARATIVE load curves included in the annual report of the general manager at Stoke-on-Trent (Mr. T. Lockett) show that, with the abolition of double summer time, the peak load on the undertaking reverted to the pre-war time of 5 p.m. The maximum demand last winter (48,350 kW) occurred on January 2nd and was the highest in the history of the undertaking.

Any loss of load through the closing of war factories was more than offset by increases in other industrial requirements, and power consumption as a whole rose from 104·6 million to 106·5 million kWh. Domestic supplies were about 10 per cent higher on the year, amounting to 63·4 million kWh. Excluding bulk supplies to other authorities, total sales aggregated 170·7 million kWh, an increase of 8·1 million kWh.

Income, at £794,939, was up by £77,283 and expenditure rose by £52,419 to £769,875, leaving a surplus of £25,064. It is pointed out that the reduction in loan charges from £145,795 to £131,752 resulted from the fact that little capital expenditure was permitted during the war. Plans authorized, however, provide for an expenditure of £128,000 on extensions chargeable to capital account and the provision of a main distribution station at Locketts Lane, Longton, will cost £250,000. On the other hand the cost of changing to 230 V originally envisaged is now avoided by the Commissioners' decision to make 240 V the standard.

Nottingham

Increases in all classes of supply except by contract are recorded in the 1945-46 report of the Nottingham Electricity Department (city electrical engineer and general manager, Mr. G. H. Lake). Sales by contract, at 67·2 million kWh were down by 12·7 million kWh (15·9 per cent), while there were gains of 17·9 and 15·2 per cent respectively under the lighting rate and domestic tariff. Altogether 220·3 million kWh was sold, an improvement of 3 million (1·4 per cent) on the previous year. The output from the generating station was 332·2 million kWh, an increase of 3·3 per cent.

An analysis of consumers and connected load shows that domestic premises supplied (excluding farms) numbered 108,059 out of a total of 119,187 consumers, their connected load being 301,221 kW (out of 455,347 kW) and aggregate consumption 98 million kWh.

The Department's total income last year was £1,141,336 (against £1,065,292) and working expenses were £915,353 (£818,111). Loan charges amounted to £190,822 (£205,211) with other net revenue charges of £92 (£30,634), leaving a net profit of £35,069 (£11,336) nearly all of which (£35,000) goes to the relief of the city rates.

Eastbourne

With the town quickly recovering from the effects of the war, the number of electricity consumers at Eastbourne increased from 18,473 to 20,470 during the year ended March 31st last; this compares with 21,030 at the outbreak of war. Sales rose from 27·5 million kWh in 1944-45 to 35·5 million last year, falling short of the 1938-39 figure by 2·8 million kWh. As an indication of the increased pressure on the undertaking the borough electrical engineer and manager (Mr. N. Boydell) mentions that the number of callers at the showrooms last year was 28,798 against 19,597 in the previous year. There is little doubt, he says, that the public is rapidly becoming electrically minded, and the process has been stimulated by wartime experiences. The accounts show a total revenue of £289,535 (against £214,032 in 1944-45) and a net profit of £6,379 (£2,621).

Cannock

Against the general trend, Cannock Electricity Department (chief engineer and general manager, Mr. P. Wardle) records a reduction in the average revenue per kWh sold (from 1·032d. to 1·017d.). From January 1st, 1945, charges to e.h.v. and l.v. bulk consumers were lowered, while ordinary tariffs remained at the pre-war level. Sales aggregated 26·8 million kWh (an increase of 6·8 per cent over 1944-45). With the connecting up of Littleton Colliery all the collieries in the area are now taking a public supply. Revenue amounted to £123,292 (£118,735) and there was a net profit of £417 (£159).

Non-Ferrous Metals Consumption

DETAILED figures of consumption of non-ferrous metals in the United Kingdom during the second quarter of 1946, covering zinc, lead, tin, nickel, cadmium, antimony, cobalt and manganese, have now been issued by the Directorate of Non-Ferrous Metals. Total figures of the consumption of virgin metal only, including for comparison the first quarter of 1946, are as follows:—

Metal	Long Tons	
	First Quarter 1946	Second Quarter 1946
Zinc	50,653	51,548
Lead	55,426	48,013
Tin	5,421	6,449
Nickel	2,098	3,094
Cadmium	127	138
Antimony	1,490	1,274
Cobalt	149	244
Manganese Metal ..	136	149

Airfield Lighting Control

Selective Pulse Switching on Telephone Relay Principles

WHAT is termed the " unit control " system of selectively switching from a distance the airfield lighting which assists aircraft to land and take off and also marks taxi-ing routes on the ground has been developed and the equipment manufactured by Standard Telephones & Cables, Ltd., to Air Ministry contract. The apparatus was finally inspected and its operation demonstrated at the makers' New Southgate works last week in the presence of officials of the Air Ministry and the Ministry of Civil Aviation prior to its installation at the London airport.

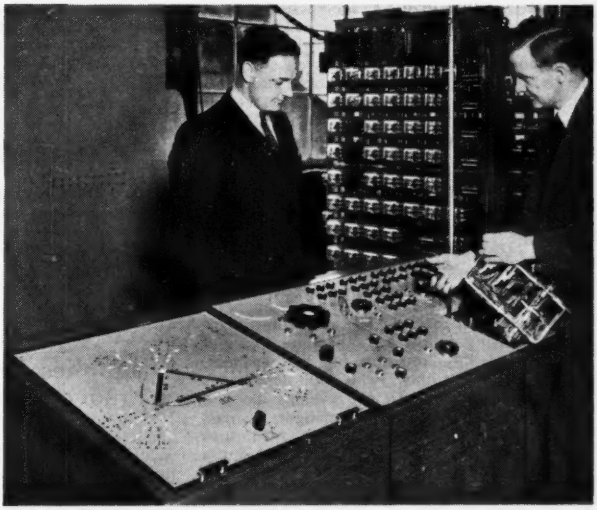
In the first stage of construction of that airfield three runways have been provided; each can be used in two directions, so that the initial selective switching requirement was for six approach and flare paths, which are illuminated by lamp fittings variously situated within a radius of 2·5 miles.

Two systems of lighting are catered for, namely, the " Drem " method utilizing filament lamps and sodium funnels as well as contact fittings as employed on Royal Air Force aerodromes during the war, while the later method uses approach fittings of high and low intensity with high intensity contact lights. In addition, angle of glide indicators, taxi, traffic and obstruction lights and beacons are common to both systems.

Thus the present three runways need over 2,100 separate electrical fittings of an aggregate of 250 kW and connected in a total of nearly 300 separate circuits, each remotely operated from a desk in the airport control tower.

Those circuits which make up the approach and contact lights are interlocked and co-ordinated in the switching system by " runway selection," which ensures that only those flare path services required for a given approach path can be illuminated at any one time. Such other non-flare path services as taxi-way and traffic lights and beacons can be individually operated independently of whichever runway may be selected for utilization.

Quick change-over and speedy response are important considerations. Any service can be switched in from one to two seconds; alternatively, the controller can set up a series of lamp-lighting sequences in any order he chooses and then put them into effect by depressing the main operating key once only, watching the result by means of " back indication " lamps beneath a coloured miniature diagram of the airfield inset in the control desk. In the event of a change of direction of wind, the controller is able (by manipulating one master runway selection switch and depressing one key) to change the whole lighting scheme in operation from any one flare path to any other in 24 seconds.



Lighting control desk with mimic airfield plan, showing lift-out panels for ease of maintenance and relay racks in background

Taxi-ing tracks, at present switched in sections, will ultimately be arranged for group switching, with " back indication " in each case.

A master check key enables the controller automatically to verify all control functions. A fault developing anywhere on the system is instantly indicated by a special lamp and operation of the " check " facility immediately displays the position of the faulty service on the mimic plan.

The control desk is built up in units on the expanding bookcase principle so that new

sections can be added to control duplicate and triplicate runways as they become serviceable without disturbing existing facilities. Present requirements are catered for by 50 switches on the control desk, of the rotary and depression types; their knobs are illuminated internally whenever manipulated. There is not sufficient space for appropriately disposing all the "back indication" lamps beneath the miniature diagram, so the light from some of them is "piped" longitudinally through bent glass rods to the required points.

The desk switches initiate pulse rhythm selection through telephone type relays specially designed for the purpose. They are rack mounted in dust-proof plastic moulded cases with a transparent front cover and plug-in base for quick replacement and easy addition, being energized with d.c. at 50 V derived through selenium rectifiers, two to each rack, from the a.c. power main.

The relay combinations control the actuation of the power contactors for selectively switching the lighting circuits as well as for transformer tap-changing to reduce voltage for dimming lights, also furnishing true "back indication" in every case, over twelve wires only and no more than those six pairs will be needed, however control requirements may be increased in future. They are provided in a 38-pair cable laid as a ring main, which includes telephone circuits and some spares not connected with the lighting control system.

The present 555 relay units are distributed among the control centre and twelve substations, arranged to permit the addition of forty further services to be controlled from each substation, making a total of 480 additional services as the aerodrome grows. The lighting circuits are contactor energized from the substations, into which an a.c. 11,000-V power cable is looped to form a ring main so that future spurs may be added for extension with minimum cable lengths.

The provision of a fourth runway will increase the number of control services by a third, while nine runways will need 3,000 circuits spread over an area of 16 sq miles.

Public Lighting Conference

THE Conference and Exhibition of the Association of Public Lighting Engineers will commence on September 10th at the Central Hall, Westminster, when Mr. A. Barnes, M.P., Minister of Transport, will give an address, after which he will declare open the exhibition of street lighting equipment. In the afternoon there will be an extraordinary general meeting, followed by the annual general meeting and the induction of the president, Mr. W. N. C. Clinch, who will deliver his presidential address. In the evening he will hold a reception at the Connaught Rooms, Great Queen Street, W.C.2.

On September 11th Mr. E. C. Lennox (Newcastle-on-Tyne), will read a paper on "Public Lighting—Administration"; he will be followed by Mr. R. Parker (Aberdeen), whose subject will be "The Public Lighting Engineer, His Organization, Staff and Training, with Postcript to Councillors." After an adjournment for lunch, the session will be continued when Mr. E. Fryer (secretary of the Automobile Association) will read a paper on "Street Lighting from the Motorists' Point of View." This will be followed by an inspection by delegates of the exhibition. In the evening a tour will be made to inspect lighting installations. During the afternoon a motor coach trip to Windsor has been arranged for the ladies.

On September 12th the proceedings will commence with a paper by Mr. C. Sugg, B.Sc., M.Inst. Gas E. At the annual luncheon, which will be held at the Connaught Rooms, the principal guest will be Mr. W. S. Morrison, M.C., K.C., M.P. The concluding session will be held in the afternoon when Mr. Davies will give a lecture and demonstration, after which visits have been arranged to Watson House, Fulham, and the Illumination Laboratory of the G.E.C. at Wembley.

The list of firms taking part in the exhibition contains 39 names including those of most of the leading makers of electric street-lighting equipment.

Supplies for Arc Welding

ALTHOUGH problems connected with the supply of electricity for arc welding plant are less acute than they are for resistance welding, they have peculiarities of their own that call for careful consideration in view of the increasing scope for arc welding in structural engineering, machine and pressure-vessel construction and shipbuilding. The subject is dealt with in a new Technical Report, K/T117, of the E.R.A. (5s. 6d.), which has been prepared by R. Neumann. Many aspects such as power factor and voltage drop are similar to those found with resistance welding, which formed the subject of a previous report, K/T110. In contrast with the latter, D.C. is largely used for arc welding and the relative merits of A.C. and D.C. are considered, leading to the conclusion that each case should be studied individually. The Report also discusses rating of plant, load characteristics and effect on supply systems and tariffs. Appendices deal with means of improving the effect of the load, with particular reference to the use of capacitors, wiring methods and different types of generators and transformers. A bibliography of 46 references is included.

ELECTRICITY SUPPLY

Belfast Plant Contract. Switch Shortage Problem.

Belfast.—TURBO-ALERNATOR CONTRACT.—The Electricity Committee has recommended the acceptance of the tender of £264,869, submitted by Metropolitan-Vickers, for the supply and erection of a turbo-alternator, with auxiliaries, at the Harbour power station.

Birkenhead.—POWER STATION EXTENSIONS.—The Electricity Committee has obtained sanction to borrow £1,650,000 for the power station extension scheme.

Doncaster.—HOUSING DEVELOPMENTS.—Mains extensions costing £45,000 to meet housing developments on the various new estates are to be carried out by the Town Council.

Helensburgh (Dumbartonshire).—DEFERMENT OF ELECTRICITY SCHEME.—Replying to the Council's proposal to install electricity in housing schemes the Department of Health states that having regard to the present shortage of labour and materials and the need to conserve skilled labour, the Secretary of State does not feel justified in consenting to the expenditure involved at the present time and requests that the proposal be deferred for six to nine months. The Council is to make further representations to the Department.

Heywood.—IMMERSION HEATERS.—The Housing Committee has decided to install immersion heaters in the 50 houses proposed to be built on Gooden Housing site.

Huddersfield. — INCREASED LOAD. — The borough electrical engineer has reported that in order to deal with additional loads it will be necessary to provide nine new substations and modify or extend 26 existing stations. Subject to the approval of the Finance Committee, application is to be made to the Electricity Commissioners for sanction to borrow £57,356.

Liverpool.—JUBILEE CELEBRATIONS.—Arrangements for celebrating the jubilee of the Liverpool Electric Supply Department include facilities for the public to inspect sections of the undertaking. Substations at Highfield Street, Paradise Street, Bolton Street and Monument Place will be open for public inspection from September 10th to 13th inclusive, Clarence Dock generating station on September 10th and 12th, and Lister Drive generating station on September 11th and 13th. The culminating event of the celebration will be on September 13th when a number of distinguished guests will participate in a day's outing, including the inspection of the Mersey Tunnel and the new penicillin factory at Speke. In the evening the Electric Power and Lighting Committee will entertain the members of the Corporation and other guests to dinner at Reeces, Parker Street. A brochure has been prepared which, although dealing mainly with the electricity supply undertaking, also shows in graphic form the progress of Liverpool and how the city is facing its post-war problems.

Luton.—DEVELOPMENT PLANS.—The Corporation has approved a £200,000 development programme for South Bedfordshire, including the erection of a primary substation about six miles from Woburn.

Mansfield. — SUPPLY TO COLLIERY. — The Electricity Committee has now arranged terms with the Bolsover Colliery Co. for a supply to the Mansfield Colliery, the costs being estimated at £17,750 for 11,000-V cables and £2,650 for switchgear and metering equipment.

LOANS APPROVED.—Sanction has been obtained by the Electricity Committee to borrow £2,374 for a substation in Chesterfield Road and £10,067 for the extension of the 11,000-V system to Mansfield Woodhouse.

Middlesex.—SCHOOL INSTALLATIONS.—Plans approved by the Education Committee provide for the installation of electricity at Greenhill School, Harrow, Whitefriars School, Wealdstone, and Alperton School, Wembley. It is also proposed to improve electric lighting at four other schools at a cost of £3,281.

Nelson.—LOAN FOR RURAL SUPPLIES.—The Town Council is making application to the Electricity Commissioners for sanction to borrow £1,800 in connection with the supply of electricity to rural areas.

Shipley.—ELECTRICITY FOR CINEMA.—The Council has decided to take no action regarding the recommendation that it should lease a site adjacent to the Glenroyal Cinema to the Shipley Picture House Co. This was required in connection with a proposal by the company to generate its own electricity. The Electricity Committee of the U.D.C. submitted that it would not be in the best interests of the Council to lease the site for such a purpose.

Spenborough.—STREET LIGHTING.—The electrical engineer has been directed to submit a comprehensive report dealing with the development of street lighting, including automatic control.

Sunderland.—SHORTAGE OF SWITCHES.—Further reference to the shortage of electrical equipment for houses is made in a report by the borough engineer of Sunderland to the Town Council. The report stated that considerable difficulties had arisen through the non-delivery of electric switches. The bottleneck appeared to be the manufacture of the porcelain parts of the switches which were entirely inadequate for needs. There did not appear to be any signs of an improvement and work was being carried out "from hand to mouth." The borough electrical engineer had suggested that certain switches in houses should be dispensed with for the time being and this would relieve the situation to a certain extent. The report added that it took 60 weeks to obtain delivery of electric cable. At present there were five houses completed and ready to be handed over except for the electric services.

Overseas

Australia.—PETITIONS AGAINST ADELAIDE BILL.—The possibility that the Electricity Trust Bill, authorizing the taking over of the assets of the Adelaide Electricity Supply Co., which was passed by a special session of the South Australian Parliament early in the year,

may be referred back to Parliament is now being discussed in Adelaide. It is understood that four petitions have been presented to the King asking that his assent should not be given to the Bill. The petition presented by the company covers 19 clauses, one of which contains eight sub-sections giving reasons why the Bill should not be agreed to by His Majesty.

BUNNERONG EXTENSIONS.—The new 50,000-kW turbo-alternator at the Bunnerong power station, Sydney, has now been placed in position and tested.

SOUTH-WEST POWER SCHEME.—The Western Australian Minister for Electricity (Mr. Hawke) reports that the State Electricity Commission has given close consideration to the proposed South-West Power Scheme, and a staff has been appointed to undertake the work incidental to the completion of the project. The engineer in charge of the scheme is Mr. J. B. Jukes who has been to the United States to secure first-hand information on rural electrification. Permanent surveys of the areas which will be supplied with power through the new scheme are shortly to be undertaken, and the Collie Power Co. has been notified of the Commission's intention to take over the company's undertaking as from October 1st.

Belgium.—EFFECT OF WAR ON OUTPUT.—In the Sofina report for 1939-45, recently issued, it is stated that the German occupation of Belgium during the war had a marked effect on the country's electric power production, the output declining from 5,798 million kWh in 1939 to 3,948 million kWh in 1944. Last year's output, although better than that of 1944, was still 22 per cent below the pre-war total due to the supply restrictions caused by the shortage of coal.

Brazil.—INCREASED OUTPUT.—While the river flows in the Rio region were still below the average last year the position was better than in 1944, and it was found possible to discontinue the rationing of supplies of power to consumers. The result was a marked advance in the year's sales of power of the Brazilian Traction, Light & Power Co., Ltd., which through its affiliated concerns controls the electricity supply in the cities of Rio de Janeiro, São Paulo and Santos. In the three areas the total was 2,606 million kWh as compared with 2,395 million kWh in 1944, the number of consumers having increased from 662,734 to 694,957. The generating capacity of the combined generating plants advanced from 612,570 to 662,570 kW and the connected load from 1,564,806 to 1,725,853 kW.

At the Serra do Cubatao plant (São Paulo system) the power house extension for the Nos. 4, 6 and 8 units, each of which will have a capacity of 91,000 H.P., was started during the year. Unit No. 4 is scheduled to come into operation by the end of the present year. At the Ribeirao des Lages installation (Rio system) work continued at a reduced rate on the reconstruction and raising of the main dam, but it will not be possible to accumulate additional water in the reservoir until the Serra-Lages transmission line comes into service in the early part of 1947. The 57,000-H.P. "C" unit at the Lages plant is expected to be in operation by the end of this year.

Another important project now in hand, and known as the Paraiba-Pirai, will permit about 675,000 H.P. of additional firm power at 60 per cent load factor to be obtained by consecutive steps in the Lages plant and, when built, 135,000 H.P. in the Lages auxiliary plant, by diverting and pumping up to 160 metric tons of water per second from the Paraiba river above Barra do Pirai via a 3¼-mile tunnel, the Pirai valley and the Vigario pool canal and tunnels, into the Lages plant, which is to be extended as required. Thus, by elevating this water about 135 ft in the Santa Cecilia and Vigario pumping plants, whenever power is available, the water can be utilized under a total head of 1,125 ft at any time when the system needs the power. The same Lages units can also use water from the Lages reservoir now being enlarged to a capacity of 1,100 million metric tons.

Eire.—RESTRICTIONS REVOKED.—The Electricity Supply Board has notified consumers that the restrictions imposed as from June 3rd are revoked and replaced by regulations ensuring improved supplies of electricity. The relaxation allowed by the latter, as from August 15th, is as follows:—Until further order the total consumption for all purposes of any consumer (excluding industrial power consumers and supplies for industrial process heating, traction and public lighting) shall not exceed 100 per cent of the ration quoted on the consumer's ration card. This has been made possible by the improved inflow and storage positions on the Shannon. At the same time consumers are reminded that a continual check is still necessary to ensure that consumption is maintained within the required limits. An abnormal demand must result in a return to severe rationing.

TRANSPORT

Gateshead.—OPERATION OF TROLLEY-BUSES.—The Gateshead and District Tramways Co., Ltd., has applied for a three years extension from July 29th, 1948, of the time limit for converting the company's trams to trolley-buses. At a conference of representatives of the Gateshead Town Council, Felling Urban District Council, the Northern General Transport Co., Ltd., and the Gateshead and District Tramways Co., Ltd., it was stated that the route to Low Fell would be the first to be converted to trolley-buses by Newcastle City Council. It was stated that the City Council had also applied to the Transport Commissioner for sanction to run trolley-buses 8 ft wide on the south side of the Tyne.

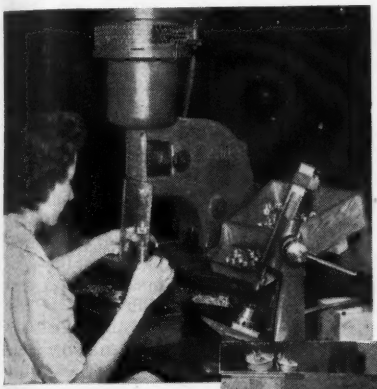
Glasgow.—DEFICIT ON YEAR'S WORKING.—The total revenue of the Transport Department for the year to May 31st last shows an increase, compared with 1944-45, of £143,632 and the total working expenses an increase of £156,043. The net result of the year's operation was a deficit of £231,901 compared with a deficit of £376,984 in the previous year.

Wolverhampton.—PROFIT ON UNDERTAKING.—The annual accounts of the Transport Department show that the gross surplus on the trolley vehicle and motor omnibus accounts was £150,809. From the net surplus of £49,343, £10,000 has been paid to the relief of the rates, £9,678 for deferred maintenance of vehicles and equipment and £20,500 for deferred vehicle purchase, leaving £9,165 for transfer to reserve.

Making Electric Clocks

Production to Meet Greatly Increased Demand

ALTHOUGH electric clocks are still something of a rarity in the shop windows, production has already nearly, if not quite, reached its pre-war figure. The reason for the shortage is that the accumulated demands of the war period both at home and abroad, coupled with the growing appreciation by the public of the merits of electric clocks, has resulted in the immediate absorption of current production and manufacturers are now busily engaged on schemes for expanding their outputs very considerably. Smith's English Clocks, Ltd., for instance, now producing electric clocks at the rate of 10,000 a week, will within about six months be turning out 16,000 per week. To this end the company, besides reorganizing its Sectric Works in Waterloo Road, Cricklewood, on the most up-to-date mass-production lines, is equipping two adjacent factories, one (previously belonging to Vactric, Ltd.) as offices, showrooms, sales, packing and dispatch departments; and the other (Goodwood Works) purely for the production of wooden clock cases.



Assembly of "Bijou" rotor with oiled felt washers

"Bijou" movements undergoing 2,000-V breakdown test and (right) a pneumatic machine for printing dials

At the moment about twenty different models of electric clocks are being made (apart from automobile varieties) and to drive these there are four main types of movement—"De Luxe," "Bijou," 24-hour auto-alarm and 12-hour non-automatic types. The "Bijou" model is available in long-spindle, short-spindle, self-start, non-self-start, back and bottom-start forms. All the components used, such as the front, middle and back plates, wheels, worm shafts and pinions, etc., are made in the machine shops of Sectric Works or in one of the company's other factories, and plastic moulding presses produce a wide variety of cases as well as back covers, handset knobs, etc. For use in conjunction with the electrically operated power presses for making cases there are electric pre-heaters for warming up flaked moulding material employed to produce a mottled effect. Goodwood Works, which is waiting for dust-extraction plant before going into service, has already been equipped with the latest types of saws, planes, spray

painting plant, polishing machines, etc., and it is aimed to make this the most modern clock case making plant in the country and perhaps the world.

Such operations as cleaning of castings, drilling and tapping, fitting pillars to back plates, rotor winding, impregnating bushes with oil, spot welding of identification plates on to the back plates, etc., are carried out on sub-assembly lines before reaching the main assembly belts. Tracing first the assembly of the " De Luxe " model, the first operation done on the main assembly line is the fixing of the impulse starter on the middle plate. The second worm shaft and pinion which engages in the rotor starter are then added, followed by the centre wheel and impulse arm. The front plate and cannon pinion are then put on.

Clocks arriving off the end of the assembly belts for inspection

The coil and stator halves are assembled complete with terminal moulding, and the rotor and starting mechanism are added. The back plates are then screwed on. After an overload test at 2,000 V for a minute, ensuring that the coil insulation is in order, the top motion work is added. Besides being impregnated with oil the " Paxolin " bearings are provided with a reservoir of oil, making further lubrication unnecessary for at least five years. The rotor, which runs at 200 r.p.m., is sufficiently powerful to drive a 20-in. clock.

The production line handling " Bijou " models is laid out to produce 2,000 clocks a day. The fitting of the studs and pins to the middle plate is the first operation of assembly, the jig employed being arranged with two levers to ensure that both hands are out of the way of the press. Trays of twenty-two stator and rotor components are placed on the conveyor belt at 7½-minute intervals and the motors when assembled are screwed on to the middle plates. A sintered bronze bearing employed for the rotor embodies two felt washers under a brass sealing washer which is spun over, the bronze itself being impregnated with oil.

After the assembly of the minute wheel and pinion on the front plate, the first wheel, the one driven by the rotor, is fitted. For the sake of quiet running this wheel is made of fibre. The fixing of the handset spindle and handset knob is done two at a time to give simultaneous and symmetrical movements by using both hands together. When the impulse starter arm has been fixed, the unit undergoes its 2,000-V overload test and passes on to receive its centre wheel, wheel train and front plate. The latest type of assembly trays ensure that all components are in the most convenient position for the operation.

Printing of the dials is carried out by an ingenious rubber stamp utilizing pneumatic pressure. After the insertion of the glass and the assembly complete with the dial and hands in the case, the finished unit goes to the test department where it is placed on circuit for a period of 24/48 hours during which any necessary adjustments are made. The alarm types of clock follow the same general procedure of assembly.

Throughout manufacture considerable use is made of vacuum cleaning and compressed air plant to keep the delicate components free from dust.

Loch Carron Scheme

THE North of Scotland Hydro-Electric Board last week published Distribution Scheme No. 10, covering the Loch Carron and Loch Kishorn districts of Ross and Cromarty, where all but three houses depend on paraffin lamps for lighting and 250 of the 257 potential consumers live in crofts or cottages. Electricity supplies will be available to 90 per cent of the people in the area when the scheme is completed. The Board will bring electricity from the Nostie Bridge power station of the Lochalsh Scheme to Stromeferry. A submarine cable will cross the Loch Carron Narrows to Stromemore. The Board's block tariff of 6d., 1d. and ½d. will be operative while power is supplied by Diesel generators. When hydro-electric development takes place in the area, the charges will be reduced to 5d., ½d. and ½d.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

A. C. Cossor, Ltd.—A number of new developments were referred to by Mr. T. A. Macauley (chairman) at the recent annual meeting. He said that the company's radio valve and cathode-ray tube business had been transferred to Electronic Tubes, Ltd., a new subsidiary formed for the purpose. The new company had a nominal capital of £300,000 and under an agreement for the reciprocal exchange of patents and technical development with Sylvania Electric Products, Inc., of the United States, the new company would be able to manufacture and market valves and tubes of the latest development and design. Their subsidiary, the Sterling Cable Co., Ltd., had formulated plans for expansion and development, and had acquired and was in process of equipping a new factory at Aldermaston. With regard to the radio and television business they were rapidly swinging back to peacetime production. As a further part of their programme two other subsidiary companies had been registered under the names of Cossor Instruments, Ltd., and Cossor Radar, Ltd. The last mentioned company would be concerned with the development and exploitation of marine and general radar equipment. Their laboratories had in hand a vast programme of work in connection with both aviation and shipping. The most outstanding progress related to their marine navigation equipment. This made use of the plan position indicator and presented ships' navigation officers with a picture of all objects within a radius of up to thirty miles surrounding the ship by night or day and regardless of fog. They had undertaken numerous installations, among them one for the *Queen Elizabeth*. They had also made considerable progress in radar equipment in the field of aviation.

Pye, Ltd.—Dealing with reconversion at the company's annual meeting last week the chairman, Mr. C. O. Stanley, said that their hopes of a rapid reconstruction had been largely unfulfilled. The production of civilian radio and television apparatus had started, but owing to shortage of supplies the quantities made had fallen far short of the totals which would otherwise have been reached. A few television sets had been built and sent out for demonstration, but no real production had been possible. Their plans were constantly being upset by interruptions outside their control which set back production. They had begun to ship reasonable quantities of radio receivers to export markets. They suggested, however, that if the Government refrained from exporting raw materials and essential parts and instead allowed them to use their manufactured parts the ultimate benefit to the country's export trade would be much greater.

In television this country still led the world, but unless we moved much faster than we were doing America would quickly leave us behind. It was wrong that it should take such a long time to implement the Hankey Report. The authorities should review the position and intensify and hasten the attack on this problem. During the year the company's research laboratories developed the Videosonic television system and they hoped soon to have the opportunity to prove its practical usefulness.

Telephone Properties, Ltd., reports a profit for 1945 of £29,935, as compared with £29,322 for 1944. The ordinary dividend for the year is maintained at 6 per cent and £43,835 is carried forward (against £43,002 brought in).

In a statement issued with the report and accounts, Sir Alexander Roger (chairman), says that the end of the difficulties of shortage of material and equipment so far as the Nacional Company in Venezuela is concerned is beginning to come within measurable distance. The administration of the Nacional Co. has had complete plans for improvement and expansion prepared for some time and for a period of several years ahead and the work based on these plans is going steadily forward. A new exchange building has been erected at Los Caobos, Caracas, and ground purchased at Chacao for another. The former is designed for an immediate installation of 7,000 lines with an ultimate capacity of 25,000. Equipment is also in course of manufacture for Maracaibo, Cuidad, Bolivar and Barquisimeto. Already in 1946 supplies to the approximate value of 1,750,000 bolivares (£130,000 at the current rate of exchange) have been shipped from Great Britain and the flow continues. In 1945, 490 exchange lines and 101 extensions were connected to the system. The total number of stations, including extensions at December 31st last, was 39,423.

The Telephone Manufacturing Co., Ltd., held its annual meeting on August 19th when Mr. F. T. Jackson (chairman and managing director), who presided, said that the profits to be earned in 1946 would not be on the same level as in the past three years. There was no lack of orders for their main factory, but they were very short of female labour and certain materials. They were continuing their research and development programme. Their woodworking plant was working to full capacity and their subsidiaries were all working at a profit. The sales company was dependent to a great extent on the works for supplies and was obtaining so much business that orders could only be accepted for forward delivery.

Newton Bros. (Derby), Ltd., report a net profit for the year ended March 31st last of £14,759, as compared with £13,645 for the previous year. The dividend for the year is maintained at 17½ per cent, and in addition a special bonus of 7½ per cent is being paid. Reserve receives £5,000, and £8,467 is carried forward (against £9,569 brought in).

Metal Industries, Ltd.—The accounts for the year to March 31st last show a net profit, before taxation, of £292,347 (against £263,998 in 1944-45). Taxation provision absorbs £148,427 (£143,071), and there are allocations of £14,450 and £59,000 respectively to the capital and general reserves which received nothing last

year. The ordinary dividend for the year is raised from 9 to 10 per cent by a final payment of 7 per cent and £98,454 (£161,390) is carried forward.

Silentbloc, Ltd., proposes to pay a final dividend of 12½ per cent, again making 25 per cent for the year.

New Companies

Swedish Ericsson Co., Ltd.—Registered August 8th. Capital, £5,000. Electricians, mechanical engineers and manufacturers, etc. Directors: H. Ericsson, Stockholm, Sweden (managing director of Telefonaktiebolaget L. M. Ericsson of Sweden) and T. A. Lundell, Weybridge. Regd. office: 32, Victoria Street, S.W.1.

Troughton & Young (Lighting), Ltd.—Registered August 9th. Capital, £15,000. Mechanical, electrical, wireless and general engineers, etc. Subscribers: A. H. Young and A. B. Read. Solicitors: Hugh Quennell, 12, Tokenhouse Yard, E.C.2.

British Power Transformer Co. (Northern Ireland), Ltd.—Registered in Belfast July 29th. Capital, £100. Manufacturers, importers and exporters of, agents for, and dealers in, electric transformers of all kinds, motor dynamos, etc. First directors: F. C. Mason, H. Paul-Huhne, R. G. Henniker and F. N. Phipps. Regd. office: Knockmore, Lisburn, Co. Antrim.

Medway Electrical Co., Ltd.—Registered August 9th. Capital, £1,500. To acquire the business of electrical engineers carried on by Heslop and Squires, trading as the Medway Electrical Co., at Edinburgh Road, Chatham. Directors: H. Fowle, A. L. Heslop, E. T. Squires and G. Fowle. Secretary: L. N. Fowle. Regd. office: 334, High Street, Chatham.

C. J. Roddis & Co., Ltd.—Registered July 13th. Capital, £100. Repairers, overhaulers and maintainers of electrical appliances and equipment, electrical contractors, etc. Directors: C. J. Roddis and S. F. Speight. Regd. office: 15, Kirkham Road, Bradford.

Electra Sales (Essex), Ltd.—Registered July 16th. Capital, £100. Manufacturers of, and dealers in, television, wireless and electrical apparatus and goods, etc. Directors: M. Wayne and A. G. Cushings. Regd. office: 142, The Grove, Stratford, E.15.

Thorpe, Glover & Co., Ltd.—Registered July 18th. Capital, £2,000. Electrical and mechanical engineers and manufacturers and distributors of electrical and mechanical apparatus and devices of all kinds, etc. Directors: D. Thorpe and D. H. Glover. Regd. office: St. Lukes Chambers, Bold Place, Liverpool, 1.

Goostry (Electric), Ltd.—Registered July 18th. Capital, £5,000. To acquire the business of an electrical contractor, including electrical engineering and construction and heating and power installation, carried on by S. Goostry at 50, Lower High Street and 2, Wharfedale Street, Wednesbury. Directors: R. Babb, H. S. Goostry, W. H. Babb and J. Babb. Regd. office: 50, Lower High Street, Wednesbury.

Factory Installations, Ltd.—Registered July 18th. Capital, £2,000. Mechanical and electrical engineers, etc. Directors: E. A. Blackburn and C. D. Frost. Regd. office: 48, Northgate Street, Leicester.

Universal Electrical Co., Ltd.—Registered July 19th. Capital, £10,000. To carry on business as indicated by the title. Directors: W. F. G. Smith, R. A. Smith, W. J. T. Smith, and H. Victor-Smith. Regd. office: 50, Pall Mall, S.W.1.

Massey & Coggins, Ltd.—Registered July 19th. Capital, £2,000. Electricians and electrical, wireless and television engineers, etc. Directors: W. A. Massey and J. Coggins. Solicitors: Silverman & Livermore, 155, Dale Street, Liverpool.

Pepper & Haywood, Ltd.—Registered August 8th. Capital, £3,000. Electrical engineers and general electrical installation contractors, etc. Directors: A. Pepper, E. R. Haywood and A. L. Cain. Regd. office: Midland Bank Chambers, Letchworth, Herts.

Arthur Miers & Co., Ltd.—Registered July 22nd. Capital, £5,000. To acquire the business of electrical engineer previously carried on by A. S. Miers at Hallgate, Doncaster. Directors: E. S. Milan, N. S. Milan, and F. Melt. Regd. office: 62, Hallgate, Doncaster.

Carr & Whiting, Ltd.—Registered July 23rd. Capital, £1,000. Electrical engineers and general electrical installation contractors, etc. Directors: J. F. Carr and W. C. R. Whiting. Regd. office: 38, Lumley Road, Horley, Surrey.

Kirdon Electric, Ltd.—Registered July 24th. Capital, £100. Wholesalers, importers, exporters and manufacturers of, and dealers in, electrical components, etc. Directors: F. R. Hopkins and R. G. Ford. Regd. office: 113, High Holborn, W.C.

Radiac, Ltd.—Registered July 25th. Capital, £100. Manufacturers, importers and exporters of, and dealers in, dynamos, motors, armatures, magnetos, etc. Subscribers: S. F. Pulvermacher and C. Stevens. Solicitors: Sheffield Powell & Scott Tucker, 20, Bedford Square, W.C.1.

Whitmore & Warwick, Ltd.—Registered July 12th. Capital, £2,000. Electrical engineers and contractors, etc. Directors: H. A. H. Whitmore and C. T. Butcher. Regd. office: 55b, Allesley Old Road, Coventry.

Bankruptcies

L. E. Holland, electrician, trading at 4, St. James's Churchyard, Haymarket, Bristol, and formerly at 67, Ashgrove Road, Horsfield, Bristol, and now residing at "Terra Cotta," West Kington, Wilts.—Application for discharge to be heard on September 20th at the Guildhall, Bristol.

E. B. Page, electrical engineer, 10 and 12, John Street, Hyde, Cheshire.—First and final dividend of 6s. 6¾d. in the £, payable August 30th at 20, Byrom Street, Manchester.

A. Ambrose, electrical engineer, 137, Market Street, Chorley, Lancs.—Application for discharge to be heard on October 29th at the Sessions Hall, Lancaster Road, Preston.

M. Skulnick, battery manufacturer, 83, Wellesley Court, Maida Vale, London.—First and final dividend of 20s. in the £, plus 4 per cent statutory interest, payable August 27th at 76, New Cavendish Street, London, W.1.

STOCKS AND SHARES

STOCK EXCHANGE markets are pursuing a somewhat erratic course. The amount of business passing in the various markets, however, is reasonably good for this time of year. Investment flows steadily in the gilt-edged sections and, among industrials, something of a feature has been an influx of buying orders from India for Imperial Chemicals, the price of which strengthened appreciably, to react as sellers took advantage of the spurt.

Declines in shares of companies which had been expected to distribute bonus shares in the more or less near future occurred as a result of the Treasury's insistence upon its refusal to permit such distributions to take place. Had it not been for nationalization uncertainties the prices of electricity supply shares would doubtless have advanced by reason of the advertisement given to electricity by the discomfort caused through the Gas Light & Coke workers' strike. Manufacturers of electrical apparatus are considered certain to benefit from the impetus which this strike has given to the demand.

Thirty Million Pounds

The additional £30 million which the Central Electricity Board is authorized to borrow, as already mentioned here, will naturally assist in providing employment and profit for a number of companies engaged in electrical equipment work. The present is too early for such consideration to exert any influence over share prices, but it may be of practical use to catalogue ordinary shares in some of the companies likely to benefit. The following list makes no claim to be anything but representative. Care has been taken to ensure that, in each case, shares are on offer in the Stock Exchange market at the prices quoted. The yields are calculated upon the dividends last paid by the companies.

Ordinary Share	Price	Yield
	s. d.	£ s. d.
British Ins. Callender's Cables ..	48 0	*
Enfield Cables	61 0	4 2 0
Enfield Rolling Mills	23 0	4 7 0
English Electric	62 0	3 4 6
General Electric	5 0	3 15 0
Gen. Cable Manufacturing ..	25 0	3 12 0
Henley (W. T.) Tel.	28 6	3 10 2
Johnson & Phillips	85 0	3 10 7
London Elec. Wire & Smiths ..	44 6	3 7 5
Siemens	36 0	4 3 4
Tel. Construction & Maint. ..	59 0	3 7 10

* Int. div. 4 per cent for 18 months.

Price Fluctuations

At 45s. Associated Electrical ordinary show a half-a-crown gain, and Aron Electrics at 71s. have put on 2s. 3d. British Insulated Callenders' rose a florin to 48s. Johnson & Phillips are 6d. better at 85s., Tube Investments, once more 6¼, are 6s. 3d. better. Lancashire Dynamo at 5⅜ have gone back to the same extent. Telegraph Constructions at 58s. 9d. and Walsall Conduits at 55s. 3d. are down 1s. 9d. Smaller falls left Vactric at 18s. 9d. and Laurence Scott 14s. 3d. On the other side of the account, there are rises in H. J. Baldwin, 13s. 3d., English Electric, 61s. 6d., and Ever Ready, 47s. 6d. De la Rue, 12¾ a month ago, have been down to 11¼ since then and are now 11⅞. Telephone Properties are unchanged at 22s. 6d. on the issue of the report. Electrolux shares are up £1, at 24½.

Communication Stocks

Cable & Wireless ordinary at 113 and the 5½ per cent preference at 117 are up 3½ and 6 respectively. Speculation canvasses various possibilities that may emerge from the present interesting position of the combine's affairs. Great Northern Telegraphs at 31½ have lost 10s. International "Tel. & Tel." regained 1½ dollars, at 27½, and Anglo-American preferred is 2 higher at 136½.

London Passenger Transport "C" at 59½ has risen 2 points and Thomas Tillings advanced to 54s.

Radio Shares

In the radio list, Scophony rallied to half-a-guinea. Decca Records, after being 3⅛, went back to 58s. 9d. The Treasury's ban on bonus issues caused disappointment to holders who had been expecting Decca to "cut a melon." Pye deferred remain dull at 38s. 9d.; E.M.I. at 32s. 9d. are unchanged. Cossor are again a heavy market at 34s. 6d. Radio and Television at 9s. recovered half their fall of last week.

Thorn Electrical

Thorn Electrical recently issued 5s. ordinary shares at 27s. 6d., which now stand at 2s. 9d. premium. The money raised by these new shares is for expansion of the business, including equipment of a new factory in South Wales; also £150,000 was required for the purchase of the Ferguson Radio Corporation, which manufactures radio equipment. Thorn has been paying 20 per cent dividend, out of earnings of 50 per cent, on the old capital, and it is generally expected that the company will be able at least to maintain this rate—hopefulness looks for an increase. The new shares do not participate in the final dividend due to be declared this month.

British Electric Traction

The British Electric Traction Company falls into what has come to be known as the "nationalization" group, and the prices of the stocks have fallen to some extent on a little nervous selling. The deferred stock came on offer at 1120, at which the return on the money is 4 per cent. During the war years 1940-46, the annual dividend was 45 per cent, accompanied in the year just ended by a 10 per cent bonus. Before the war the company used to pay 5 per cent cash and 10 per cent in deferred ordinary stock. The net profit has risen since 1942 from £606,000 to £733,000 last year, the latter allowing a 55 per cent dividend and bonus payment, with a comfortable amount over.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKT.-GES. Brown, Boveri & Cie.—"Regulating device for pressure liquid controlled prime movers." 3253/43. February 3rd, 1942. (579277.)

B.P.L. (Instruments), Ltd., and B. Digby.—"Electric amplifier." 7681. April 25th, 1944. (579407.)

British Thomson-Houston Co., Ltd., and S. A. Couling.—"Apparatus for utilizing the exhaust from a gas or oil engine." 1991. February 13th, 1942. (579318.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Gas turbine power plants." 14147. August 30th, 1943. (579420.)

British Thomson-Houston Co., Ltd., W. J. Scott, R. G. Saunders and R. Latham.—"Velocity-modulated electron discharge tubes." Cognate applications 8639/41, 2643/43 and 5168/42. July 9th, 1941. (579412.)

C.F. Burgess Laboratories, Inc.—"Primary cells and batteries." 278/43. December 26th, 1941. (579326.)

E. L. W. Byrne (Titeflex, Inc.).—"Ventilated radio-shielded spark plug." 5915. March 30th, 1944. (579298.) "Radio-shielded enclosures for the ignition systems of internal-combustion engines." 33813/45. March 30th, 1944. (Divided out of 579298.) (579308.)

H. A. M. Clark.—"Electrical systems for utilizing acoustic or electromagnetic vibratory energy for directional indicating purposes." 33504. November 18th, 1938. (579360.)

Compania para la Fabricacion de Contadores y Material Industrial, and P. Viteau.—"Means for amplifying the deflection of a directed electron beam." 3065. February 18th, 1944. (579394.)

H. Constant, D. M. Smith and Metropolitan-Vickers Electrical Co.—"Gas turbines, axial flow or turbine type gas compressors and the like machines." 5943. May 7th, 1941. (579316.)

M. Cook, W. O. Alexander and Imperial Chemical Industries, Ltd.—"Wrought metal electrical resistance materials." 14740. September 8th, 1943. (579380.)

A. C. Cossor, Ltd., and L. H. Bedford.—"Electrical calculating or measuring apparatus." 14082. October 7th, 1942. (579274.)

A. C. Cossor, Ltd., and L. Jofeh.—"Electrical apparatus." 6489. April 6th, 1944. (579299.)

A. C. Cossor, Ltd., L. H. Bedford, J. Bell and E. M. Langham.—"Electrical calculating apparatus." 17006. November 30th, 1942. (579325.) "Electrical measuring apparatus." 20008/43. November 30th, 1942. (Divided out of 579325.) (579336.) "Electrical measuring apparatus." 20009/43. November 30th, 1942. (Divided out of 579325.) (579337.) "Electrical measuring or control apparatus." 20010/43. November 30th, 1942. (Divided out of 579325.) (579338.) "Cathode-ray tubes." 20011/43. November 30th, 1942. (Divided out of 579325.) (579339.)

J. A. Crabtree & Co., Ltd., W. E. Hill and T. D. G. Wintle.—"Electric fuse boxes." Cognate applications 5275/44 and 13236/44. March 21st, 1944. (579357.)

A. G. Crossland.—"Electric circuit connections." Cognate applications 7176/44 and 19114/44. April 18th, 1944. (579301.)

Ferranti, Ltd., and J. A. Darbyshire.—"Electric discharge devices." 5849. March 30th, 1944. (579435.)

General Electric Co., Ltd., and E. T. Cooke.—"Adjustable concentric transmission lines." 1042. January 20th, 1943. (579276.)

General Electric Co., Ltd., and V. J. Francis.—"Apparatus of which a h.p.m.v. electric discharge device is a part." 10091. August 8th, 1941. (Addition to 518782.) (579270.) "H.p.m.v. electric discharge lamps." 13394. October 17th, 1941. (579366.)

General Electric Co., Ltd., V. J. Francis and E. Kettlewell.—"H.p.m.v. electric discharge lamps." 15204. November 26th, 1941. (579272.)

General Electric Co., Ltd., V. J. Francis and E. H. Nelson.—"H.p.m.v. electric discharge lamps." Cognate applications 12842/43 and 20477/43. August 9th, 1943. (579375.)

General Electric Co., Ltd., E. H. Nelson and V. J. Francis.—"Sealing electrical conductors through quartz and the like." Cognate applications 14028/41 and 14050/41. October 31st, 1941. (579415.)

General Motors Corporation.—"Electromagnetic direction indicator systems." 5957/44. May 19th, 1943. (579439.)

W. T. Gray and Metropolitan-Vickers Electrical Co., Ltd.—"Cranes, hoists and the like." 1552. January 25th, 1940. (579410.)

J. W. Hill.—"Electron discharge devices employing hollow resonators." 4040. March 26th, 1942. (579320.)

E. A. Hinksman.—"Control circuits for rectifiers." 6491. April 6th, 1944. (579444.)

E. N. Kennedy.—"Fuse carriers or bridges for electric distribution boxes and the like." 5149. March 20th, 1944. (579354.)

G. A. Laughton and H. N. Cox.—"Portable radio sets for mounting on vehicles, aircraft, or the like." 7031. April 17th, 1944. (579300.)

G. Liebman and Cathodeon, Ltd.—"Electron discharge devices." 2342. February 23rd, 1942. (579319.)

A. Mandl and Metropolitan-Vickers Electrical Co., Ltd.—"Dynamo electric machines." 3371. February 22nd, 1940. (579411.)

M. Bowman Manifold.—"Electron discharge devices employing hollow resonators." 4253. March 29th, 1941. (579315.)

Marconi's Wireless Telegraph Co., Ltd.—"Television transmitting apparatus." 8555/42. June 21st, 1941. (579273.)

V. Mayer.—"Winding of dynamo-electric machines." 5667. March 28th, 1944. (579400.)

H. T. Mitchell and T. Kilvington.—"Radio aid to navigation." 3865. March 1st, 1944. (579346.)

M-O Valve Co., Ltd., and J. Bell.—"Thermionic valves, especially those adapted to

operate at very high frequencies." 17311. October 20th, 1943. (579389.)

M-O Valve Co., Ltd., and H. S. Smith.—"Bases of electron discharge devices." 11508. June 16th, 1944. (579304.)

A. F. Pearce.—"Hollow electrical resonators." 1918. February 13th, 1942. (579317.)

Phillips Lamps, Ltd., and E. C. Martin.—"Manufacture of ceramic materials of high permittivity." 6295. April 4th, 1944. (579404.)

Pritchett & Gold & E.P.S. Co., Ltd., E. M. O. Honey and C. R. Hardy.—"Acid containers." 14899. September 10th, 1943. (579382.)

Siemens Bros. & Co., Ltd., and B. A. Hensler.—"Telephone systems." 6985. April 15th, 1944. (579455.)

F. Sigmund and W. S. Hlavin.—"Dynamo-electric machines." 11058. July 7th, 1943. (579372.)

Standard Telephones & Cables, Ltd.—"Means for preventing the spreading of high density electron beams." 9486/43. June 15th, 1942. (579371.)

Standard Telephones & Cables, Ltd., and T. A. J. Jaques.—"Electrical contact arrangements particularly for use with high frequencies." 7168. June 6th, 1941. (579365.)

Standard Telephones & Cables, Ltd., and D. C. Rogers.—"Electric wave filters." 13272. October 15th, 1941. (579414.)

A. H. Stevens (Gibson Electric Refrigerator Corporation).—"Domestic refrigerators of the continuous absorption type." 19093. November 16th, 1943. (579287.)

Western Electric Co., Inc.—"Electron discharge devices." 15238/43. June 19th, 1942. (579384.)

Westinghouse Brake & Signal Co., Ltd., L. E. Thompson and A. Jenkins.—"Rectifying detectors for high-frequency alternating electric currents." 12019. August 26th, 1942. (579322.)

A. H. Williams.—"Secondary batteries." 12854. October 4th, 1941. (579271.)

Amended Specification.

572911. Heating Construction, Ltd., and another.—"Electric reflector fires."

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Ashton-under-Lyne.—September 9th. Housing Committee. Electrical wiring of 70 permanent houses. (August 16th.)

Birkenhead.—September 13th. Electricity Department. Switchgear and transformers. (August 16th.)

Chesterfield.—September 12th. Electricity Department. Seven 250-kVA outdoor distribution transformers. H.v. and m.v. cables. (See this issue.)

Chester-le-Street.—September 2nd. Rural District Council. Electrical installations in 80 permanent houses at Plawsworth Road, Sacriston, and 80 houses at Birtley. F. Bowman, housing architect, Birtley Estate Office, Great North Road, Birtley. (Returnable deposit of £1 1s.)

Edmonton. — September 4th. Borough Council. Two vertical spindle centrifugal pumps, each complete with electric motors, switchgear, etc., for Cuckoo Hall sewerage scheme. (Deposit £3). E. J. Willis, borough engineer, Town Hall, Edmonton, N.9.

Kingston-upon-Thames.—September 30th. Borough Council. Tower wagon for street lighting purposes. (See this issue.)

Llandrindod Wells.—September 7th. Urban District Council. 400-kVA transformer, with h.v. and l.v. switchgear. (See this issue.)

Oldham.—August 31st. Electricity Department. Cable, earthenware ducts and cable covers. (August 2nd.)

Radcliffe.—August 28th. Electricity Department. One 750-kVA and two 500-kVA transformers. (August 16th.)

Sale.—August 26th. Town Council. Complete power and lighting installations in 88 houses on the Carrington Lane site. Borough electrical engineer.

Stockport.—September 11th. Town Council. Electrically-driven borehole pump for the Gas Department. T. Reynolds, gas engineer, Portwood Gasworks.

Stoke Newington.—August 27th. Borough Council. Conversion of radio apparatus on consumers' premises. (August 9th.)

Wilton.—August 31st. Town Council. Public lighting installation. Borough surveyor, Municipal Offices, Fugglestone House.

Orders Placed

Mansfield.—Electricity Committee. Accepted. Three 300-kVA transformers (£1,117).—Electric Construction Co. Switchgear (£2,901).—Met.-Vick.

Sleaford.—Housing Committee. Accepted. Electrical installations in houses on the Woodside estate.—J. T. Barnes & Sons.

Tynemouth.—Housing Committee. Accepted. Wiring 24 "Orlit" houses (£561).—J. B. Thomson.

Wallasey.—Electricity Committee. Accepted. Ripple control apparatus.—Automatic Telephone & Electric Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Adwick-le-Street.—Houses (34), for U.D.C.; C. F. Ward, builder, High Street, Carcroft, Doncaster.

Alfreton.—Houses (56), Firs estate; H. Taylor, architect, Regal Chambers, Cavendish Road, Chesterfield.

Ayr.—Hospital at Heathfield for Town Council; burgh surveyor.

Barnard Castle.—Houses (34), Middleton; F. Blenkinsopp, R.D.C. surveyor.

Bedlington.—Cinema; J. H. Simson, architect, 78, Bewick Road, Gateshead.

Belfast.—New cinema, dance room and café, Royal Avenue (£60,000); Odeon Theatres, London.

Bellingham (Northumberland).—Houses (30), for the R.D.C.; W. Dixon & Son, architects, 1, Collingwood Street, Newcastle-on-Tyne.

Birkenhead.—Houses (36), Mount estate (£37,158); Lloyd & Cross, Ltd.

Dry-cleaning works; Merseyside Cleaners, Ltd., 96, Westbourne Grove.

Blackpool.—Houses (24) and 12 flats, Grange Park (£38,730); North Western Construction Co., Ltd.

Bristol.—Houses (96), West Town, Knowle; and houses (81), Doncaster Road, Southmead; H. W. Webb, city engineer, 7, College Fields, Clifton.

Caernarvonshire.—Police houses (50), on approved sites; W. Ll. Jones, county architect, County Offices, Caernarvon.

Cardiff.—Nurses' hostel, Newport Road, for Royal Infirmary; H. W. Fletcher, architect, 21, Dumfries Place.

Charlton Kings.—Houses (56), Ewens Farm estate (£64,983); J. Costello & Co., builders, 17, Rotunda Terrace, Cheltenham.

Chester-le-Street (co. Durham).—Houses (160), for R.D.C.; F. Bowman, surveyor, R.D.C. Offices.

Factory, Picktree Lane, for Rodney Dresses, Ltd.; J. G. Cowe & Son, architects, Central Chambers.

Croydon.—Primary school for 480, Heathfield estate; borough architect.

Darlington.—Houses (102), for Town Council; G. Dougill & Son, Chesnut Street.

Houses (86), for Town Council; H. Parvin & Son, Bondgate.

Block of offices for Whessoe Engineers, Ltd.; Nox, Ltd., 55, New Bond Street, London.

Dartford.—" Easiform " houses (100), Temple Hill estate; Gough Cooper & Co., Ltd.

Works extensions, Millpond Road; Burroughs Wellcome & Co.

Derbyshire.—County primary school, Allestree; J. Harrison, county architect, St. Mary's Gate, Derby.

Dunston.—Factory for the Northern Bedding Co., Blaydon; Anglo-Scottish Construction Co., Gosforth, Newcastle-on-Tyne.

Felling (co. Durham).—Houses (200); surveyor, U.D.C. Offices.

Gateshead.—Factory for the Bren Manufacturing Co. on the North East Trading Estate; Anglo-Scottish Construction Co., Gosforth, Newcastle-on-Tyne.

Houses (160), Coach Road and Lobley Hill; G. Wimpey & Co., Ltd., builders, Dunston-on-Tyne.

Haddington (East Lothian).—Permanent houses (59), for Town Council; town clerk.

Hartley Wintney.—Houses (28), Odiham (£39,708); Pool & Sons, Ltd.

Hathersage.—Modern secondary school for Derbyshire Education Committee; F. H. Crossley, county architect, County Offices, St. Mary's Gate, Derby.

Hayes.—Primary school, Charville Lane (£47,000); Middlesex county architect.

Horbury (Yorks).—Houses (50), Manor Fields estate; H. Senior, clerk, Town Hall.

Jarrow.—Factory, Bede Trading Estate; G. Henderson, Boldon Lane, East Boldon, co. Durham.

Extensions, Technical School (£10,310); H. T. M. Wigham, Castletown.

Kettering.—Houses (36), for Town Council (£43,162); A. F. Keach & Sons, builders, 9, Station Road, Burton Latimer.

Knaresborough.—Houses (30), for U.D.C. (£34,247); H. Dodd, builder, 75, Leeds Road, Harrogate.

Lichfield.—Houses (62), Armitage, Chasetown, Botany Bay, Swinfen and Packington; G. K. Pullen, clerk, Rural Council House.

Lutterworth.—Houses (40), for R.D.C. (£47,642); J. Jelley & Son, builders, 42, Shenton Street, Leicester.

Maidstone.—Houses (46), for R.D.C.; J. H. Nicholson, surveyor, 26, Tonbridge Road.

Manchester.—Works extension, Collyhurst; Elliott & Crabtree, Ltd., starch manufacturers, Lilley Street.

Milford Haven.—Houses (50), Coombs estate (£59,000); Phelps & Owen, builders.

Northumberland.—Junior and infant school at Bebside; county architect, County Hall, Newcastle-on-Tyne.

Prudhoe-on-Tyne.—Houses (32) at Oaklands (£37,255); E. Jeffock (Contractors), Ltd., Walbottle Road, Newburn-on-Tyne.

Rochdale.—Houses (200), for Town Council; J. Hobson & Sons, Ltd., builders, Newark Street Works, Nottingham.

Police stations and residences at Norden and Balderstone (£14,300); S. H. Morgan, borough surveyor, Town Hall.

Ryton-on-Tyne.—Houses (100), at Crawcrook; U.D.C. surveyor.

Seaham Colliery (co. Durham).—Houses (88); W. Leech, Clayton Street, Newcastle-on-Tyne.

Shipley.—Houses (51), Crag Road; U.D.C. surveyor.

Sunderland.—Additions to Corporation Quay including new cranes and cold storage facilities (£423,000); borough engineer.

Tain (Ross-shire).—Houses (50), for Town Council; A. Ross & Son, architects, 28, Queensgate, Inverness.

Timperley.—School, Mayfield Road, for Cheshire Education Committee; E. M. Parkes, county architect, The Castle, Chester.

Wallsend.—Houses (84), Churchill Street; J. H. James, builder, Archer Street, Willington Quay.

Wigan.—Extensions to schools (£17,000); L. Lyon, borough surveyor, Town Hall.

Wirral.—Houses (42), Somerset Pensby; W. F. Roberts, Council Offices, Heswall.

York.—Secondary school, Backfield Lane; city architect.